

Service  
Service  
**Service**



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240407

# Service Manual

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# 1. Technical Specifications, Connections, and Chassis Overview

## Index of this chapter:

- 1.1 Technical Specifications
- 1.2 Side and Rear Connections
- 1.3 Chassis Overview

## Notes:

- Figures can deviate due to the different set executions.
- Specifications are indicative (subject to change).

## 1.1 Technical Specifications

### 1.1.1 Vision

Display type	: CRT, Real Flat
Screen size	: 21" (55 cm), 4:3
Tuning system	: PLL
Presets/channels	: 100
Tuner bands	: Full-Cable
TV colour systems	: PAL B/G, D/K, I (all models) : SECAM B/G, D/K (only /56, /63, and /69)
Video playback	: NTSC, PAL (all models) : SECAM (only /56, /63, and /69)
Aerial input	: 75 ohm, F-type

### 1.1.2 Sound

Sound systems	: Stereo BTSC
Maximum power ( $W_{RMS}$ )	: 1 x 5 or 2 x 5 (depending on model)

### 1.1.3 Miscellaneous

Power supply:	
- Mains voltage ( $V_{AC}$ )	: 100 - 240 (/56 and /94) : 180 - 240 (/63, /69, and /79)
- Mains frequency (Hz)	: 50 / 60
Ambient conditions:	
- Temperature range (°C)	: +5 to +40
- Maximum humidity	: 90% R.H.

Power consumption (values are indicative)

- Normal operation (W)	: $\approx 70$
- Stand-by (W)	: < 7

## 1.2 Side and Rear Connections

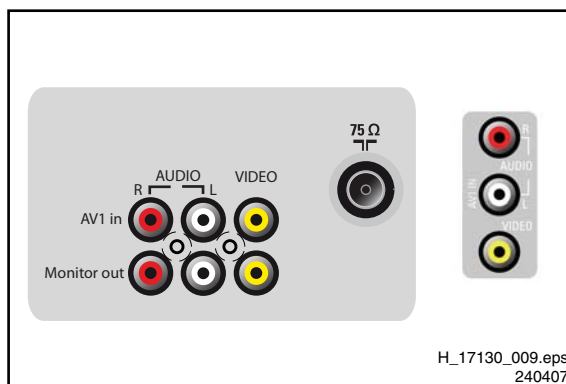


Figure 1-1 Rear and Side I/O connections

**Note:** The following connector colour abbreviations are used (acc. to DIN/IEC 757): Bk= Black, Bu= Blue, Gn= Green, Gy= Grey, Rd= Red, Wh= White, and Ye= Yellow.

### 1.2.1 Rear I/O Connections

<b>AV In</b>		
Ye - Video (CVBS)	1 V <sub>pp</sub> / 75 ohm	⊕⊗
Wh - Audio - L	0.5 V <sub>rms</sub> / 10 kohm	⊕⊗
Rd - Audio - R	0.5 V <sub>rms</sub> / 10 kohm	⊕⊗

<b>AV Out</b>		
Ye - Video (CVBS)	1 V <sub>pp</sub> / 75 ohm	⊗⊕
Wh - Audio - L	0.5 V <sub>rms</sub> / 10 kohm	⊗⊕
Rd - Audio - R	0.5 V <sub>rms</sub> / 10 kohm	⊗⊕

<b>Aerial In</b>		
- F-type	Coax, 75 ohm	⊥

### 1.2.2 Side I/O Connections

<b>AV In</b>		
Ye - Video (CVBS)	1 V <sub>pp</sub> / 75 ohm	⊕⊗
Wh - Audio - L	0.5 V <sub>rms</sub> / 10 kohm	⊕⊗
Rd - Audio - R	0.5 V <sub>rms</sub> / 10 kohm	⊕⊗

### 1.3 Chassis Overview

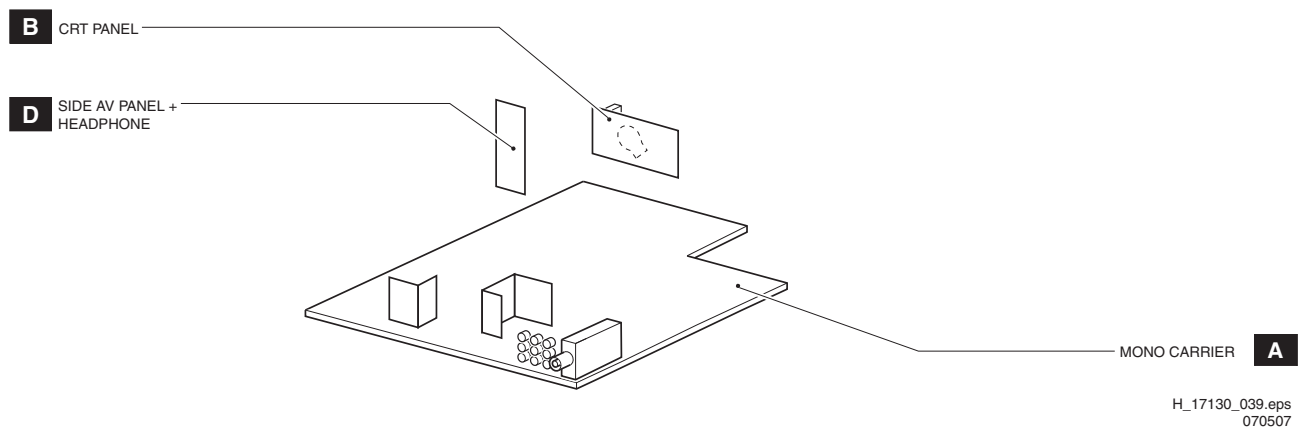


Figure 1-2 PWB/CBA locations (depending on model)

## 2. Safety Instructions, Warnings, and Notes

### Index of this chapter:

- 2.1 Safety Instructions
- 2.2 Maintenance Instructions
- 2.3 Warnings
- 2.4 Notes

### 2.1 Safety Instructions

Safety regulations require the following **during** a repair:

- Connect the set to the Mains/AC Power via an isolation transformer (> 800 VA).
- Replace safety components, indicated by the symbol ▲, only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.
- Wear safety goggles when you replace the CRT.

Safety regulations require that **after** a repair, the set must be returned in its original condition. Pay in particular attention to the following points:

- General repair instruction: as a strict precaution, we advise you to re-solder the solder connections through which the horizontal deflection current flows. In particular this is valid for the:
  1. Pins of the line output transformer (LOT).
  2. Fly-back capacitor(s).
  3. S-correction capacitor(s).
  4. Line output transistor.
  5. Pins of the connector with wires to the deflection coil.
  6. Other components through which the deflection current flows.

**Note:** This re-soldering is advised to prevent bad connections due to metal fatigue in solder connections, and is therefore only necessary for television sets more than two years old.

- Route the wire trees and EHT cable correctly and secure them with the mounted cable clamps.
- Check the insulation of the Mains/AC Power lead for external damage.
- Check the strain relief of the Mains/AC Power cord for proper function, to prevent the cord from touching the CRT, hot components, or heat sinks.
- Check the electrical DC resistance between the Mains/AC Power plug and the secondary side (only for sets that have a Mains/AC Power isolated power supply):
  1. Unplug the Mains/AC Power cord and connect a wire between the two pins of the Mains/AC Power plug.
  2. Set the Mains/AC Power switch to the "on" position (keep the Mains/AC Power cord unplugged!).
  3. Measure the resistance value between the pins of the Mains/AC Power plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 Mohm and 12 Mohm.
  4. Switch "off" the set, and remove the wire between the two pins of the Mains/AC Power plug.
- Check the cabinet for defects, to prevent touching of any inner parts by the customer.

### 2.2 Maintenance Instructions

We recommend a maintenance inspection carried out by qualified service personnel. The interval depends on the usage conditions:

- When a customer uses the set under normal circumstances, for example in a living room, the recommended interval is three to five years.
- When a customer uses the set in an environment with higher dust, grease, or moisture levels, for example in a kitchen, the recommended interval is one year.
- The maintenance inspection includes the following actions:

1. Perform the "general repair instruction" noted above.
2. Clean the power supply and deflection circuitry on the chassis.
3. Clean the picture tube panel and the neck of the picture tube.

### 2.3 Warnings

- In order to prevent damage to ICs and transistors, avoid all high voltage flashovers. In order to prevent damage to the picture tube, use the method shown in figure "Discharge picture tube", to discharge the picture tube. Use a high voltage probe and a multi-meter (position  $V_{DC}$ ). Discharge until the meter reading is 0 V (after approx. 30 s).

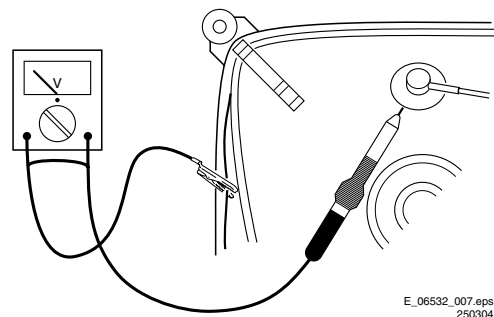


Figure 2-1 Discharge picture tube

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD ▲). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.
- Be careful during measurements in the high voltage section.
- Never replace modules or other components while the unit is switched "on".
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and prevents circuits from becoming unstable.

### 2.4 Notes

#### 2.4.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground (⊥), or hot ground (⊕), depending on the tested area of circuitry. The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode (see chapter 5) with a colour bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz for PAL, or 61.25 MHz for NTSC (channel 3).
- Where necessary, measure the waveforms and voltages with (⏏) and without (⏏) aerial signal. Measure the voltages in the power supply section both in normal operation (⏏) and in stand-by (⏏). These values are indicated by means of the appropriate symbols.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.

### 2.4.2 Schematic Notes

- All resistor values are in ohms, and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kohm).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 ohm).
- All capacitor values are given in micro-farads ( $\mu = \times 10^{-6}$ ), nano-farads ( $n = \times 10^{-9}$ ), or pico-farads ( $p = \times 10^{-12}$ ).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An "asterisk" (\*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Spare Parts List. Therefore, always check this list when there is any doubt.

### 2.4.3 Lead-free Soldering

Due to lead-free technology some rules have to be respected by the workshop during a repair:

- Use only lead-free soldering tin Philips SAC305 with order code 0622 149 00106. If lead-free solder paste is required, please contact the manufacturer of your soldering equipment. In general, use of solder paste within workshops should be avoided because paste is not easy to store and to handle.
- Use only adequate solder tools applicable for lead-free soldering tin. The solder tool must be able:
  - To reach a solder-tip temperature of at least 400°C.
  - To stabilize the adjusted temperature at the solder-tip.
  - To exchange solder-tips for different applications.
- Adjust your solder tool so that a temperature of around 360°C - 380°C is reached and stabilized at the solder joint. Heating time of the solder-joint should not exceed ~ 4 sec. Avoid temperatures above 400°C, otherwise wear-out of tips will increase drastically and flux-fluid will be destroyed. To avoid wear-out of tips, switch "off" unused equipment or reduce heat.
- Mix of lead-free soldering tin/parts with leaded soldering tin/parts is possible but PHILIPS recommends strongly to **avoid** mixed regimes. If this cannot be avoided, carefully clear the solder-joint from old tin and re-solder with new tin.

### 2.4.4 Alternative BOM identification

The **third digit** in the serial number (example: BF2A0635000001) indicates the number of the alternative

B.O.M. (Bill Of Materials) that has been used for producing the specific TV set. In general, it is possible that the same TV model on the market is produced with e.g. two different types of displays, coming from two different suppliers. This will then result in sets which have the same CTN (Commercial Type Number; e.g. 28PW9515/12) but which have a different B.O.M. number.

By looking at the third digit of the serial number, one can identify which B.O.M. is used for the TV set he is working with. If the third digit of the serial number contains the number "1" (example: BF1A0635000001), then the TV set has been manufactured according to B.O.M. number 1. If the third digit is a "2" (example: BF2A0635000001), then the set has been produced according to B.O.M. no. 2. This is important for ordering the correct spare parts!

For the third digit, the numbers 1...9 and the characters A...Z can be used, so in total: 9 plus 26 = 35 different B.O.M.s can be indicated by the third digit of the serial number.

**Identification:** The bottom line of a type plate gives a 14-digit serial number. Digits 1 and 2 refer to the production center (e.g. AG is Bruges), digit 3 refers to the B.O.M. code, digit 4 refers to the Service version change code, digits 5 and 6 refer to the production year, and digits 7 and 8 refer to production week (in example below it is 2006 week 17). The 6 last digits contain the serial number.



E\_06532\_024.eps  
130606

Figure 2-2 Serial number (example)

### 2.4.5 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages.** While some may not be dangerous in themselves, they can cause unexpected reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.

## 3. Directions for Use

You can download this information from the following websites:

<http://www.philips.com/support>

<http://www.p4c.philips.com>

## 4. Mechanical Instructions

### Index of this chapter:

- 4.1 Set Disassembly
- 4.2 Assy / Board Removal
- 4.3 Service Positions
- 4.4 Set Re-assembly

**Note:** Figures below can deviate slightly from the actual situation, due to the different set executions.

### 4.1 Set Disassembly

Follow the disassemble instructions in described order.

#### 4.1.1 Rear Cover Removal

**Warning:** disconnect the mains power cord before you remove the rear cover.

1. Remove all the fixation screws of the rear cover [1] and [2].
2. Now, pull the rear cover backwards and remove it.

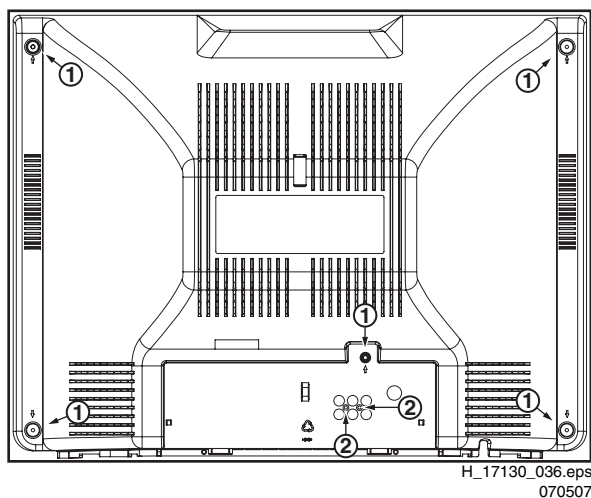


Figure 4-1 Rear Cover removal (SL5 styling)

### 4.2 Assy / Board Removal

Sometimes, it can be necessary to swap a complete assy or Printed Wiring Board (PWB). How that can be done is explained below.

#### 4.2.1 Side IO/Keyboard Panel Removal

1. Remove the fixation screws [3].
2. Remove the module from the TV.

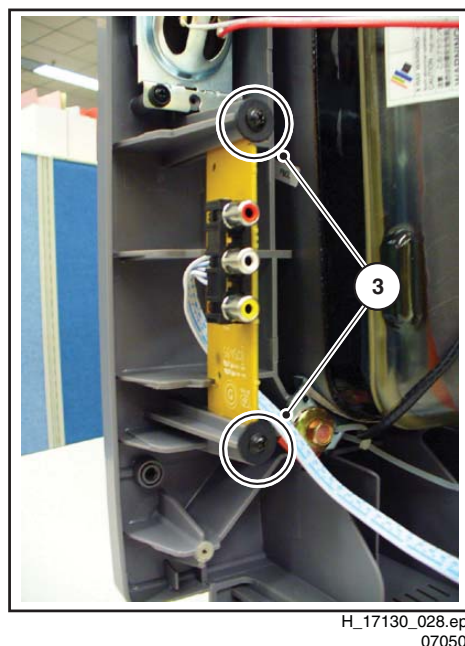


Figure 4-2 Side-IO/Keyboard panel removal (SYRF styling)

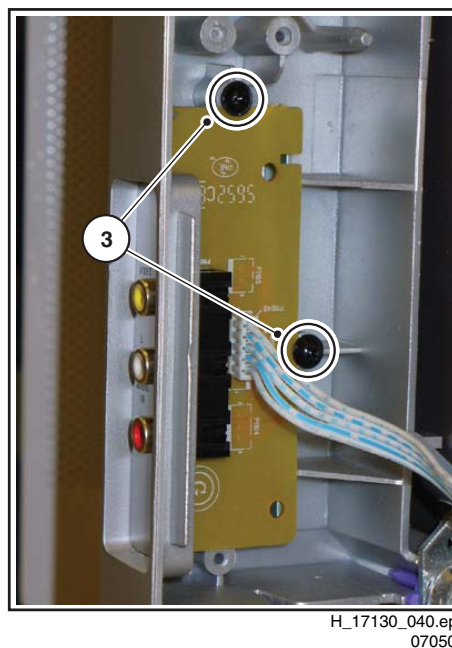
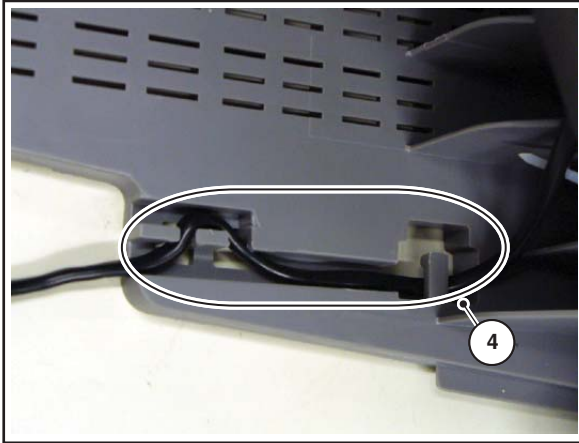


Figure 4-3 Side-IO/Keyboard panel removal (SL5 styling)



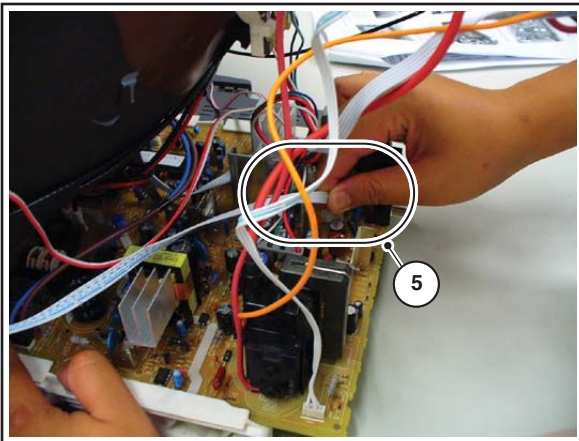
### 4.2.2 Mono Carrier Removal

1. First, disconnect the strain relief of the AC power cord [4].
2. Disconnect all the necessary cables [5].
3. To remove the Mono Carrier; release the clamps [6] and slide the whole panel backwards [7] (= away from the front).
4. Slide the panel away from the cabinet.



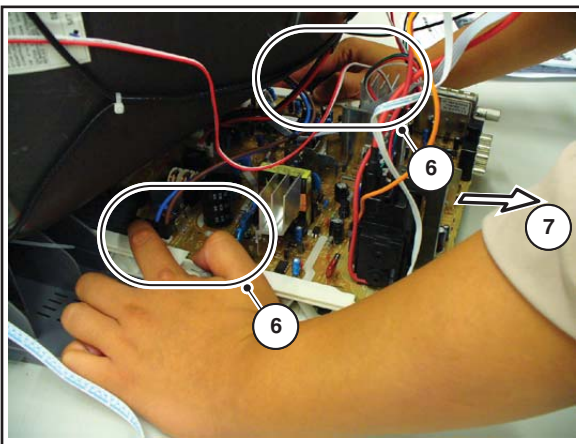
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Figure 4-4 Mono carrier removal [1/4]



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Figure 4-5 Mono carrier removal [2/4]



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Figure 4-6 Mono carrier removal [3/4]

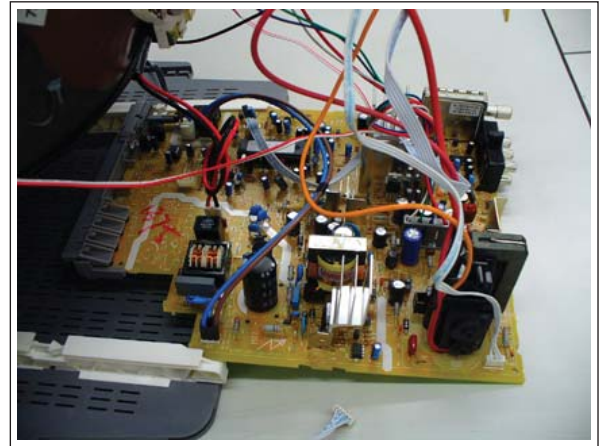
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Figure 4-7 Mono carrier removal [4/4]

## 4.3 Service Positions

For easy measurements, you can use the following service position.

### 4.3.1 Service Position Mono Carrier

#### *Removing cables and repositioning the panel*

For better accessibility of the Mono Carrier, do the following (see next figure):

1. If necessary, disconnect some cables, and move the panel somewhat to the left. Then flip it 90 degrees with its components towards the CRT.

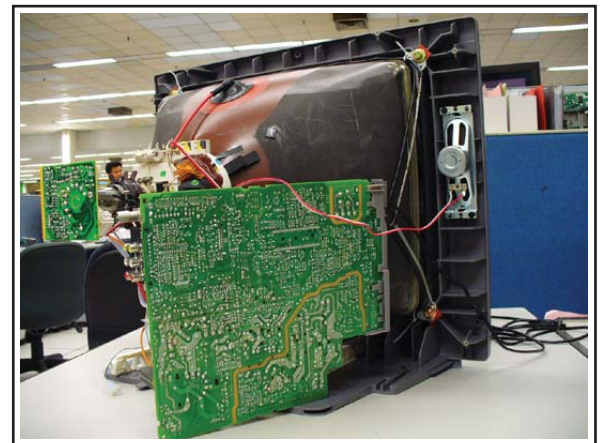
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Figure 4-8 Service position Mono Carrier

## 4.4 Set Re-assembly

To re-assemble the whole set, do all processes in reverse order.

Be sure that, before the rear cover is mounted:

- The mains cord is positioned correctly in its guiding brackets (make sure that the strain relief is replaced in its correct position and that it will function correctly!).
- All wires/cables are returned in their original positions.

## 5. Service Modes, Error Codes, and Fault Finding

### Index of this chapter:

- 5.1 Service Modes
- 5.2 Error Codes
- 5.3 Fault Finding

### 5.1 Service Modes

For an explanation of the Factory Mode, see chapter 8 “Alignments”.

### 5.2 Error Codes

Not applicable for this chassis.

### 5.3 Fault Finding

#### 5.3.1 No Picture, No Sound, No Raster, Fuse Broken

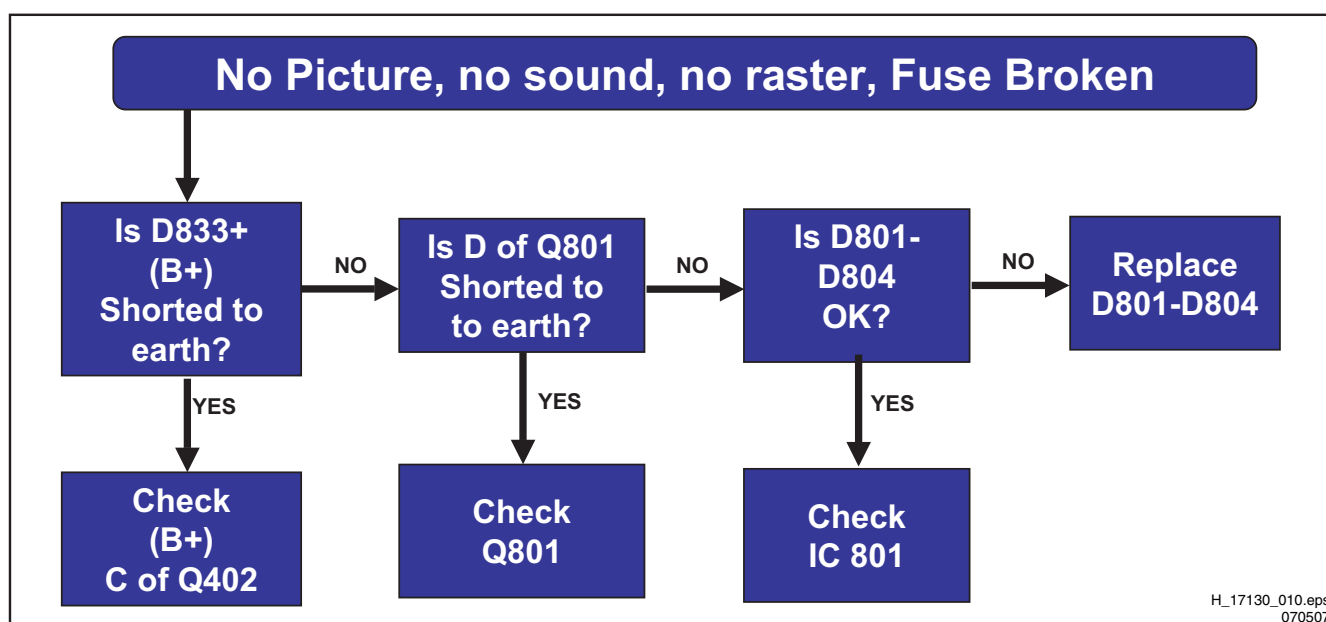


Figure 5-1 Flow chart “No Picture, No Sound, No Raster, Fuse Broken”.



## 5.3.2 No Picture, No Sound, No Raster, B+ OK

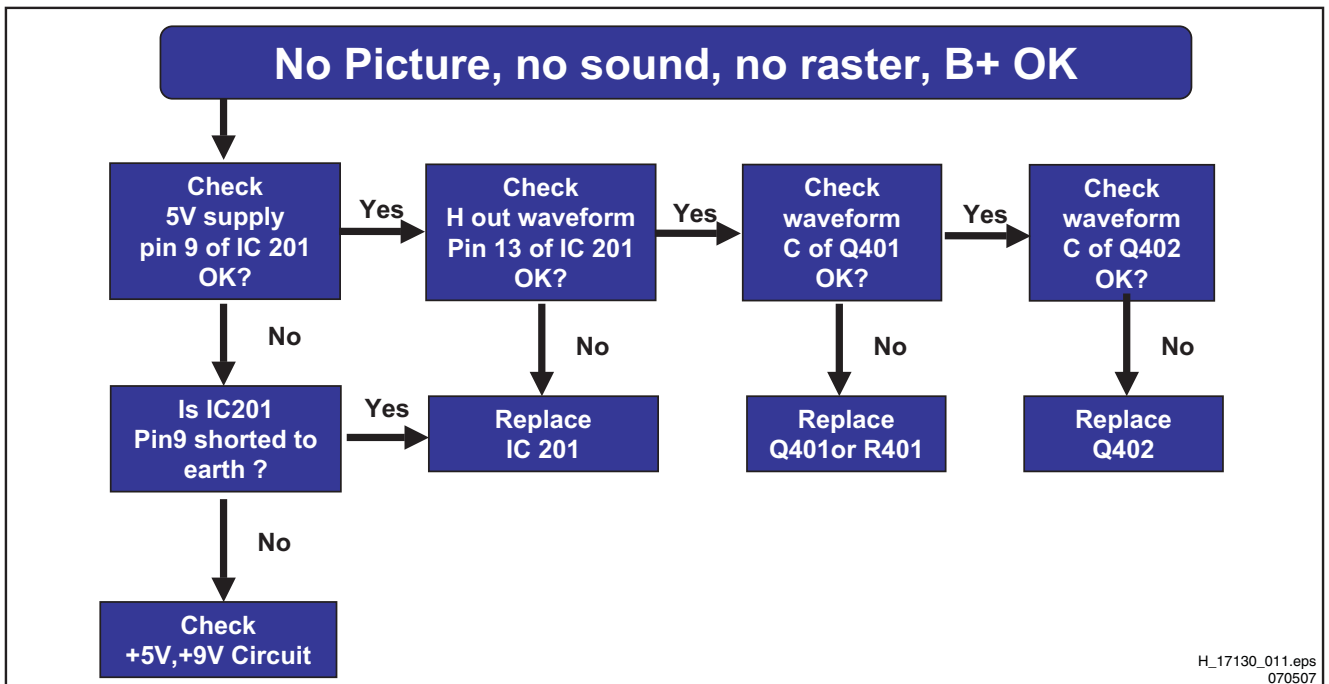


Figure 5-2 Flow chart "No Picture, No Sound, No Raster, B+ OK".

## 5.3.3 No Picture, Raster and Sound OK

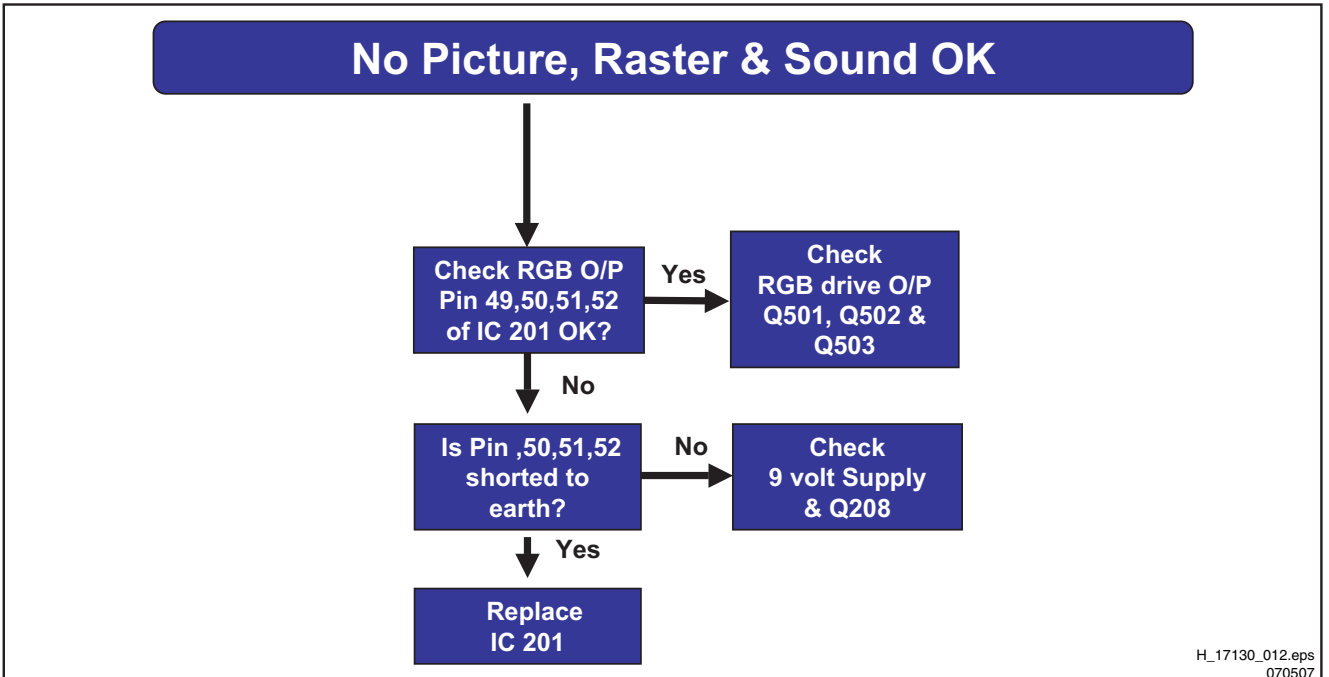


Figure 5-3 Flow chart "No Picture, Raster and Sound OK".

5.3.4 Picture OK, No Sound

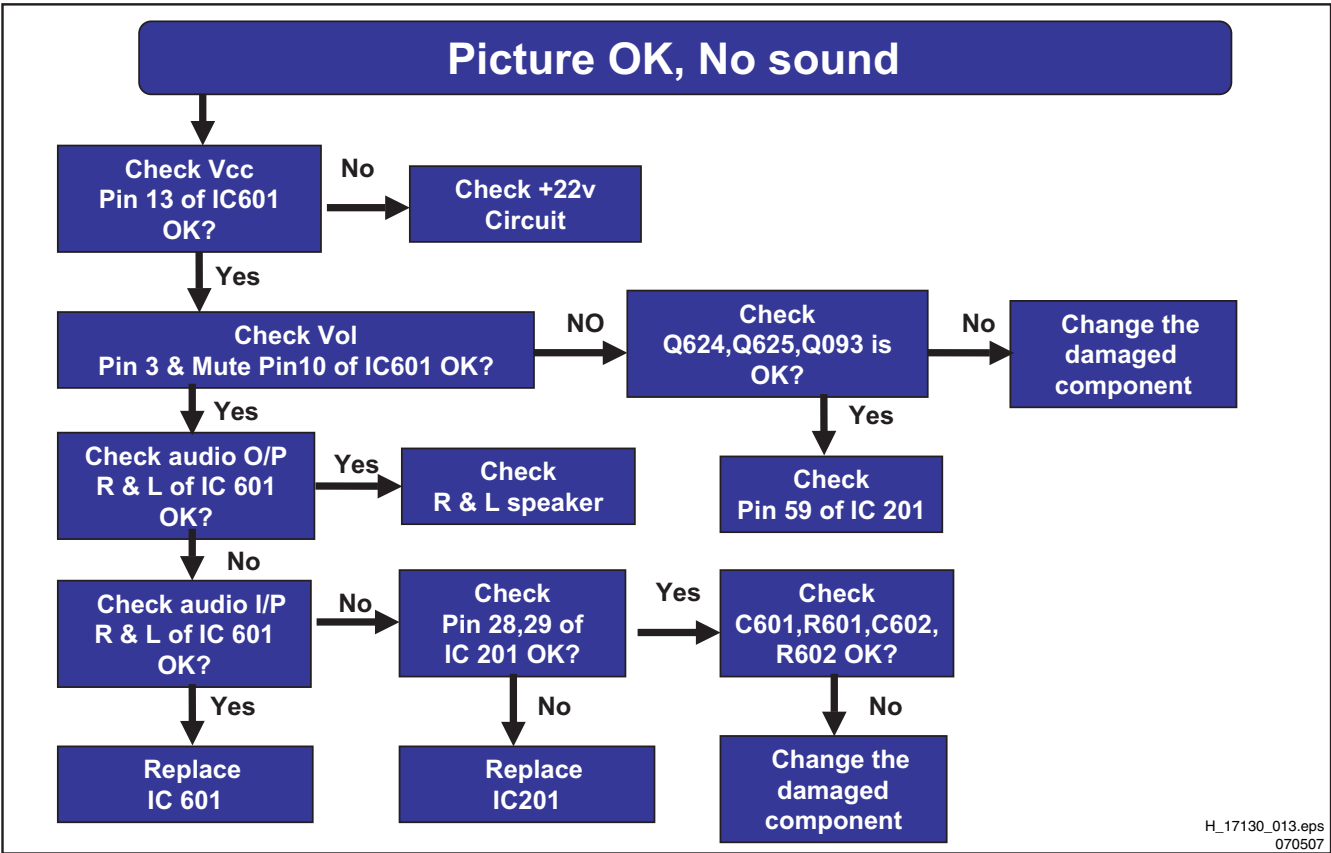


Figure 5-4 Flow chart “Picture OK, No Sound”.

5.3.5 No Colour

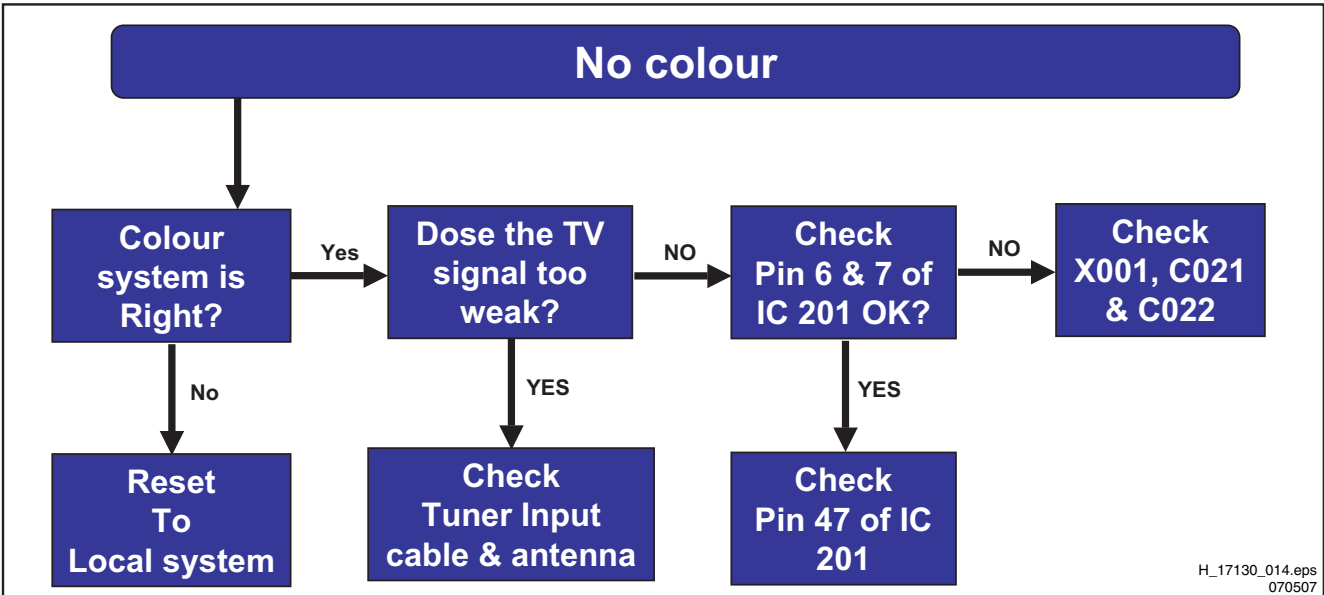


Figure 5-5 Flow chart “No Colour”.

## 5.3.6 One Horizontal Line

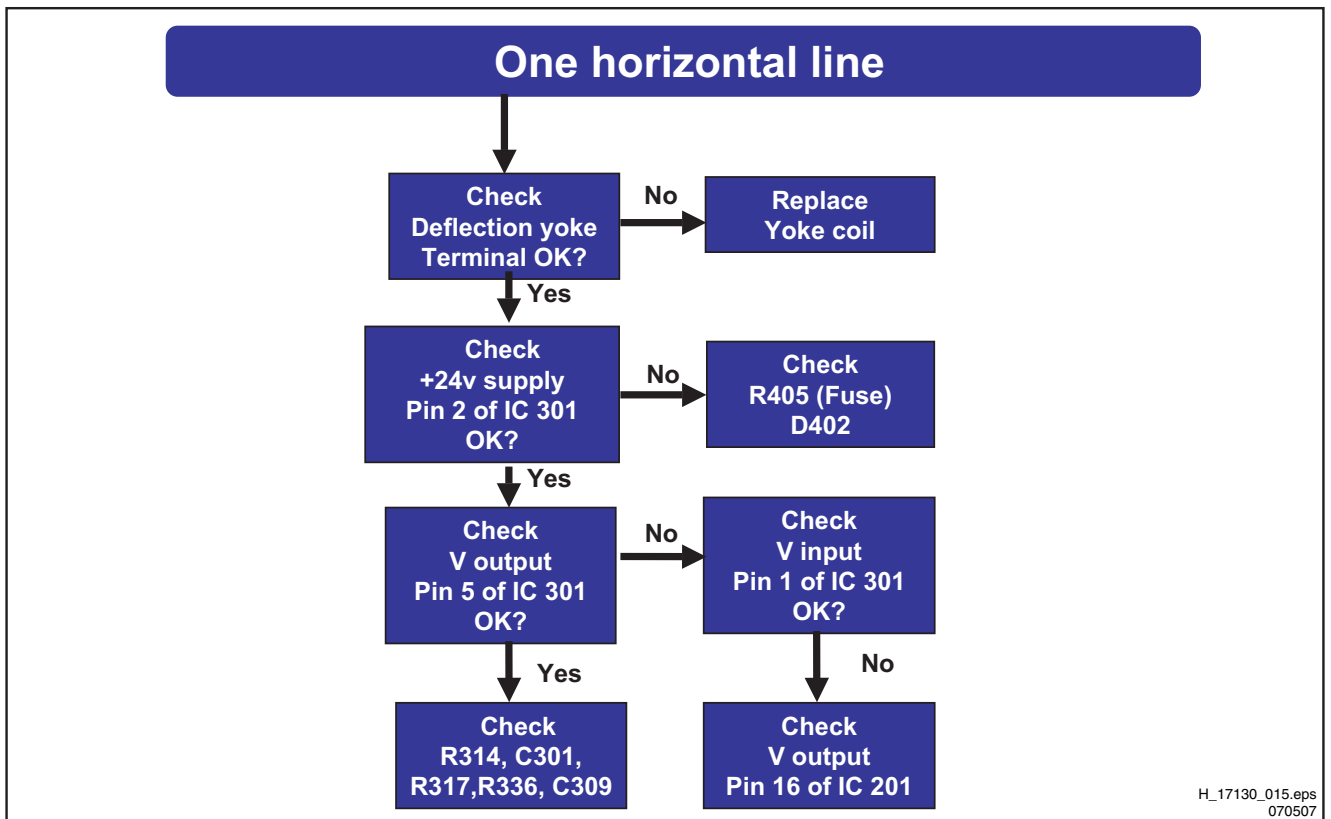
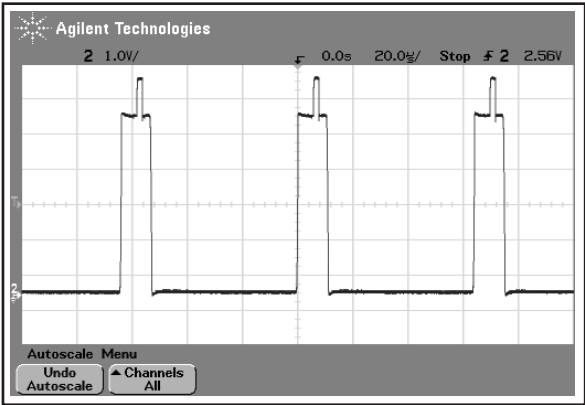


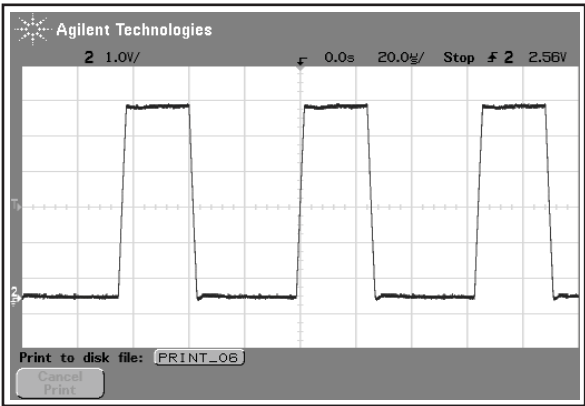
Figure 5-6 Flow chart "One Horizontal Line".

5.3.7 Some Waveforms:



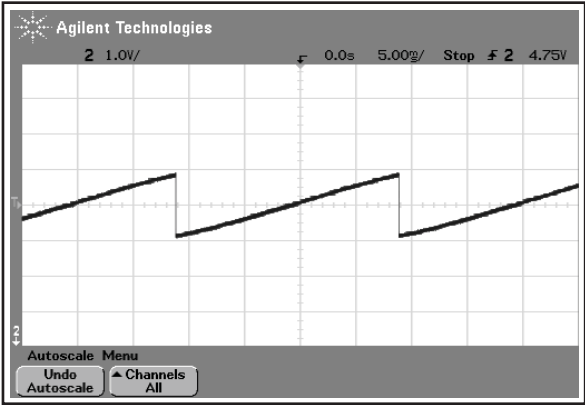
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Figure 5-7 FBP pin 12 of IC201



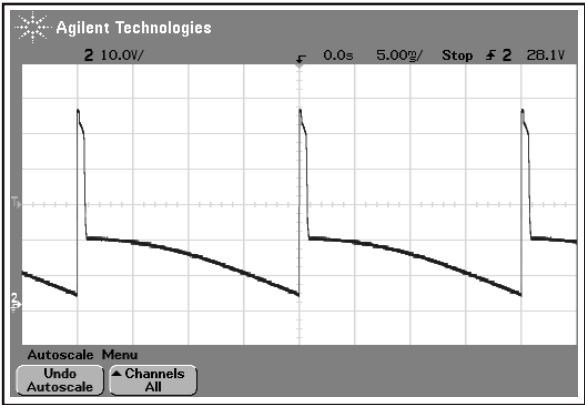
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Figure 5-8 H\_out pin 13 of IC201



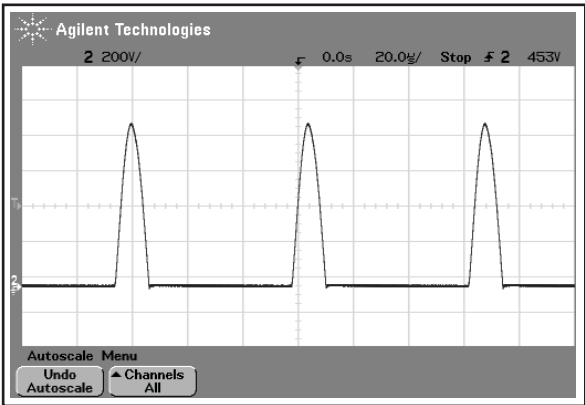
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Figure 5-9 V-out pin 16 of IC201



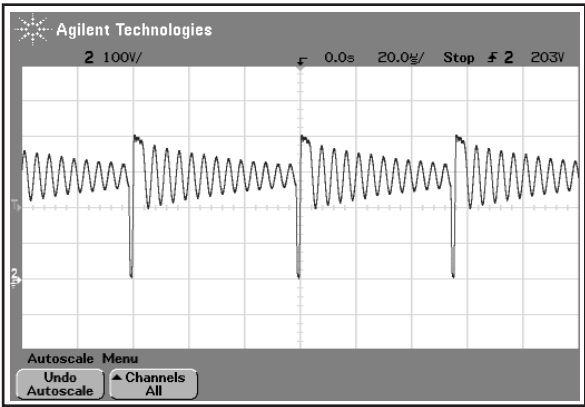
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Figure 5-10 V-out pin 5 of IC301



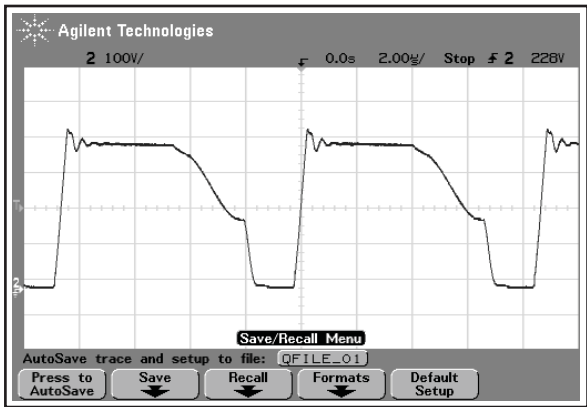
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Figure 5-11 Q402 C



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Figure 5-12 Q815 drain when stand-by



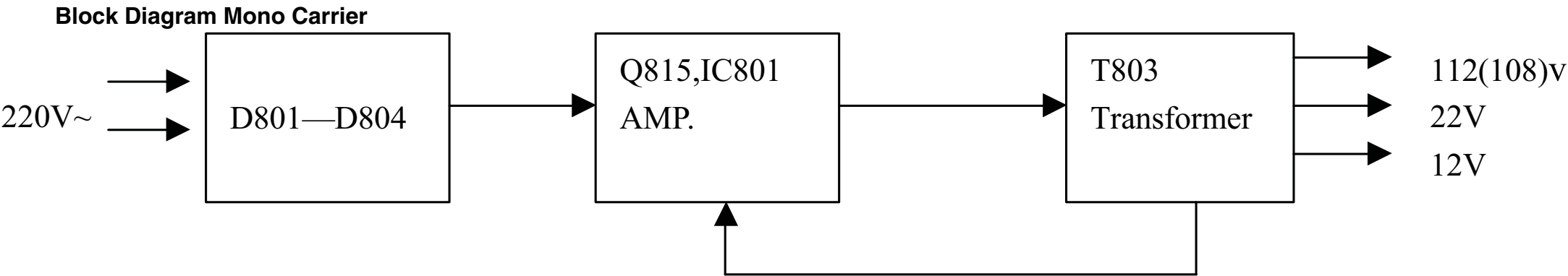
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Figure 5-13 Q815 drain

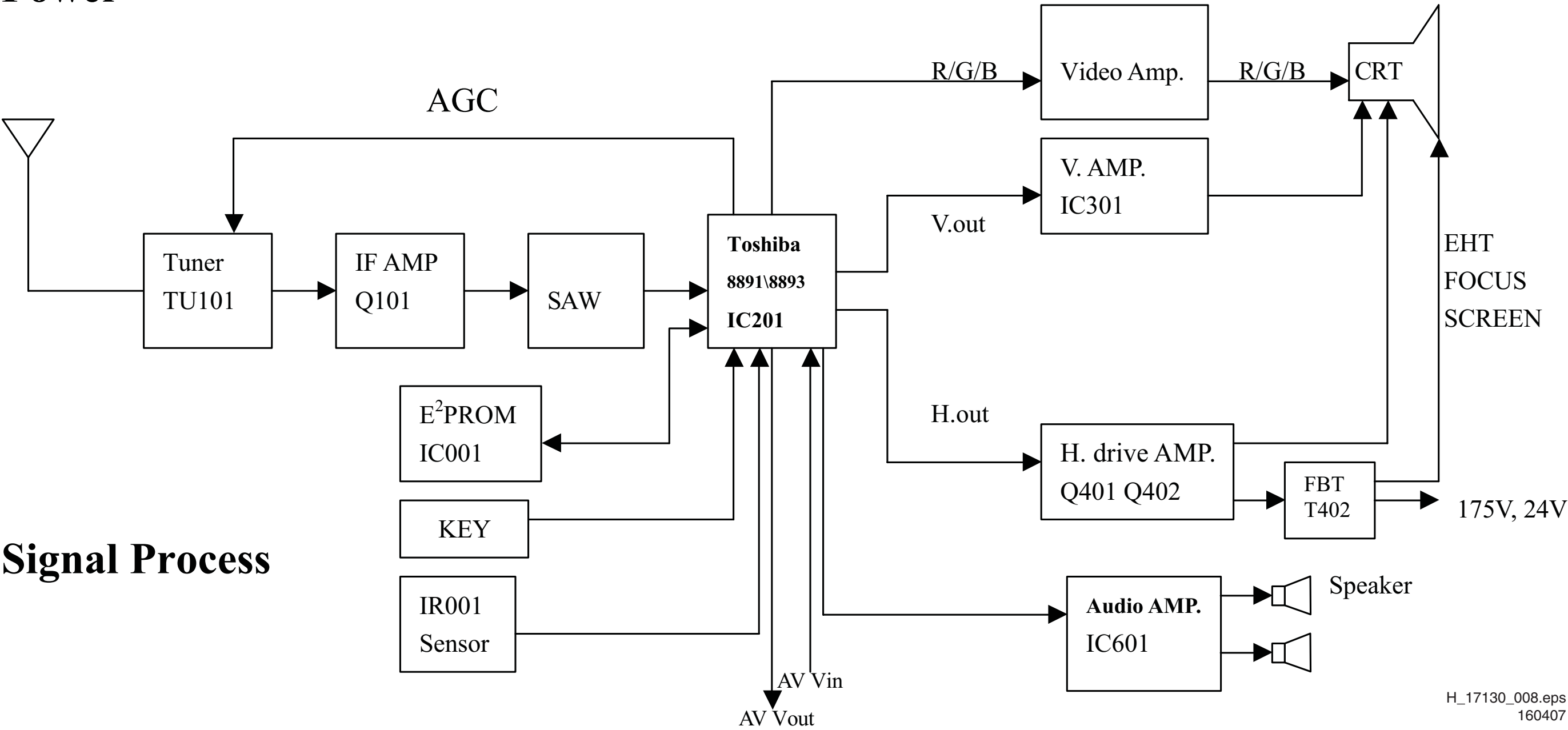
5.3.8 Important Voltages Overview

Line	Position	Normal (V)	Standby (V)
1	B+ Joint of L801 and R826A	+110.8	+96.9
2	Joint of C834 and D831	+13.0	+10.9
3	Joint of L212 and C090	+5.0	+0.0
4	Pin99 of IC200	+4.8	+0.0

6. Block Diagrams, Test Point Overview, and Waveforms



Power

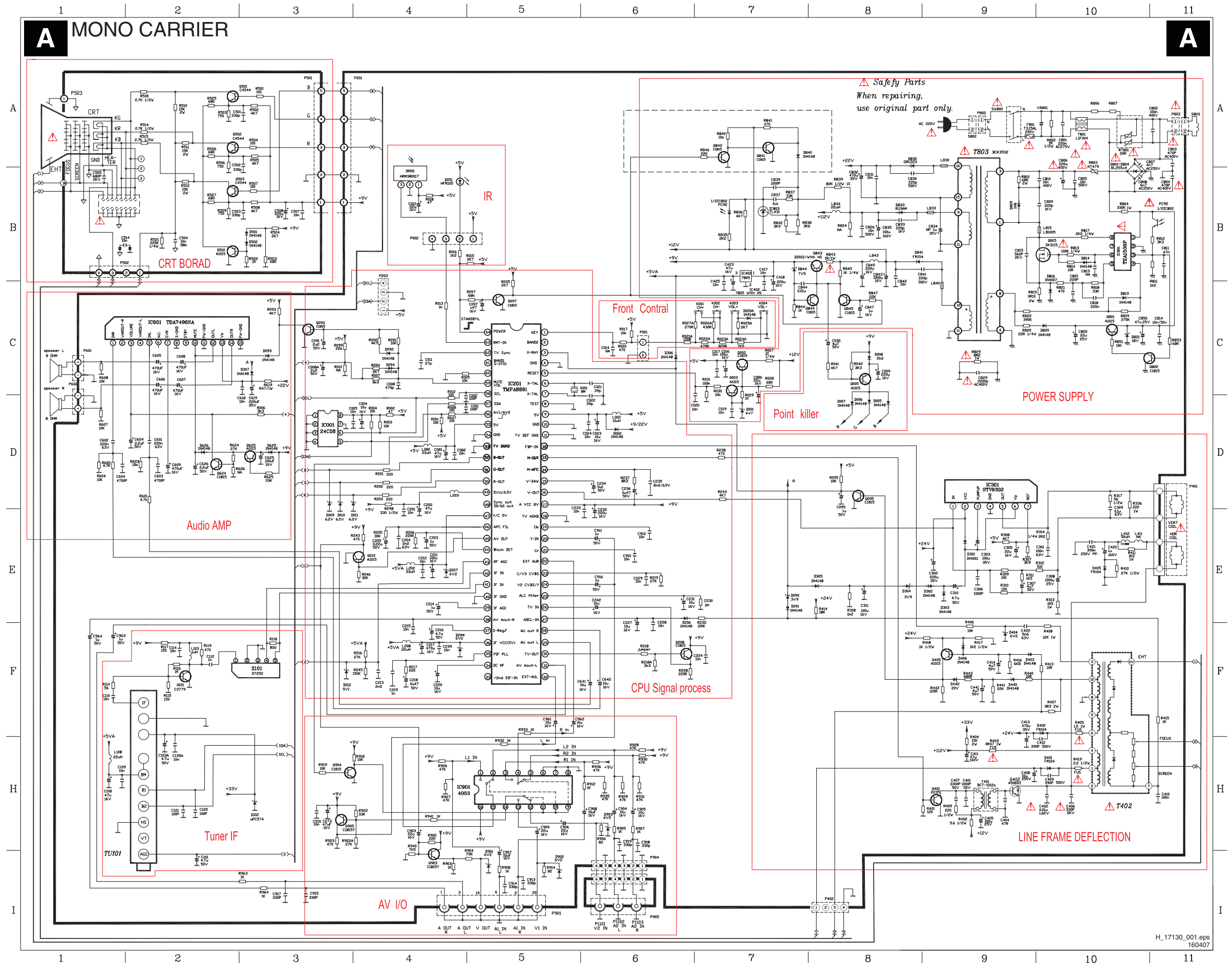


Signal Process



## 7. Circuit Diagrams and PWB Layouts

### Mono Carrier





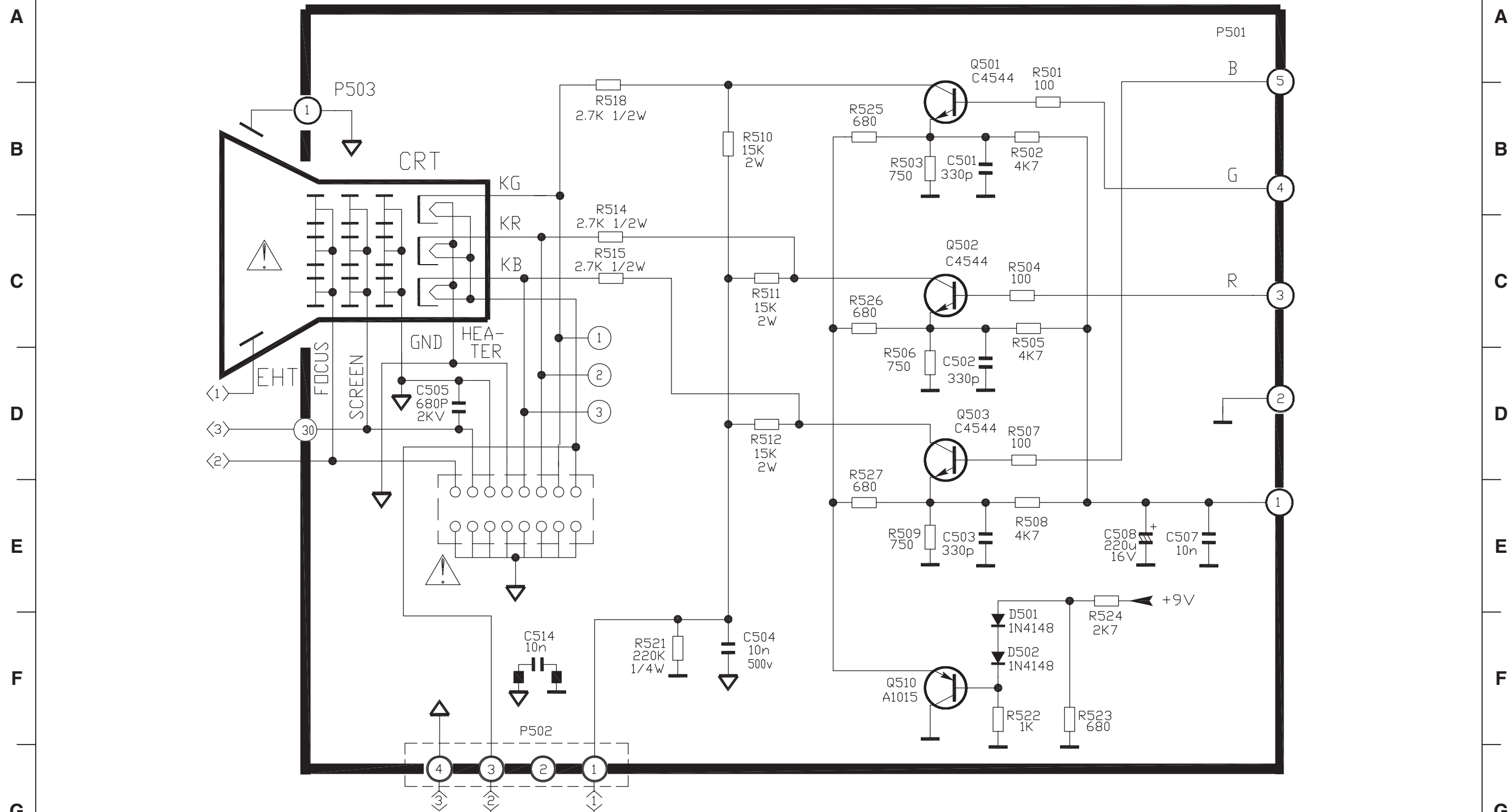




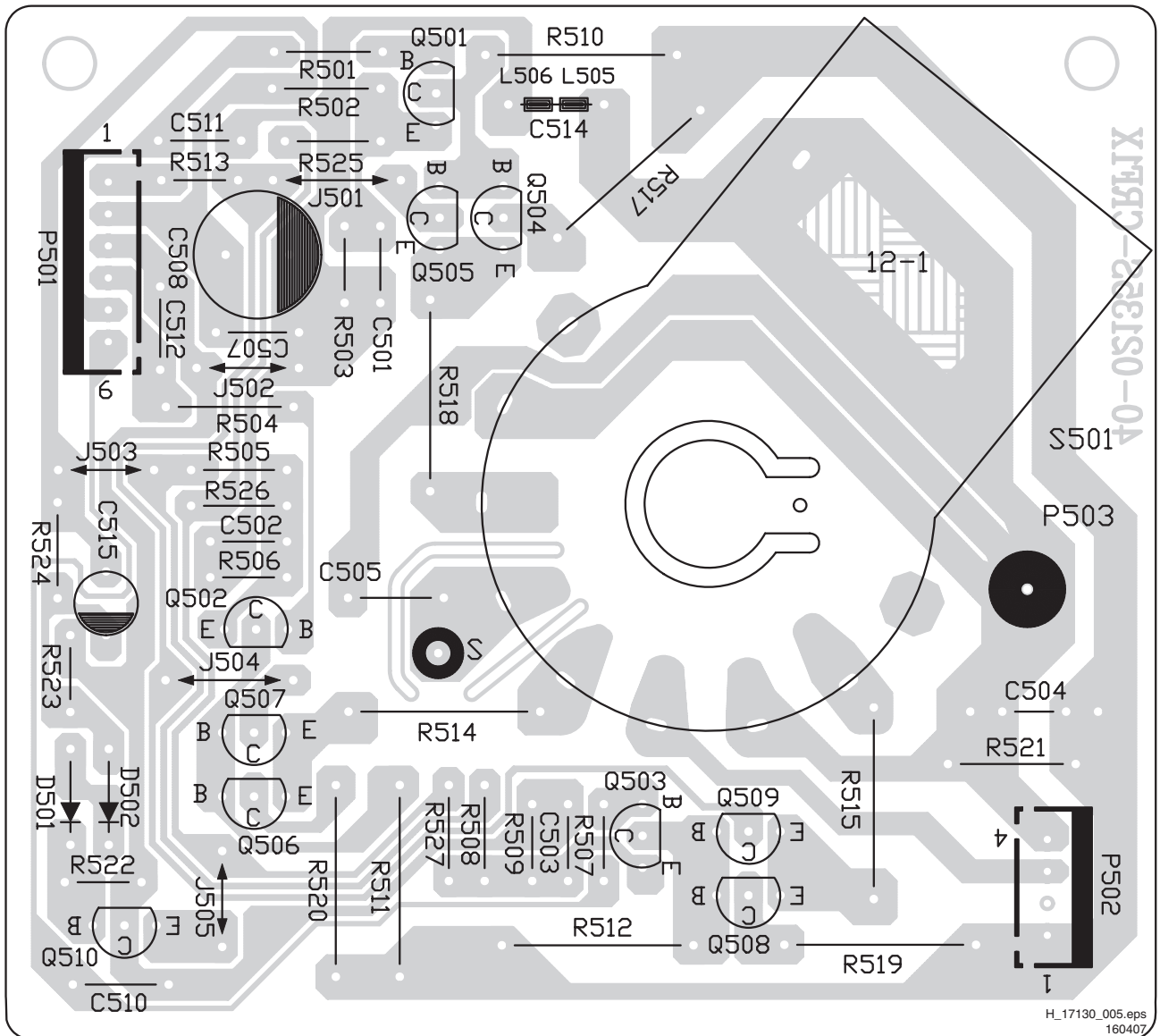
## CRT Panel

## B CRT PANEL

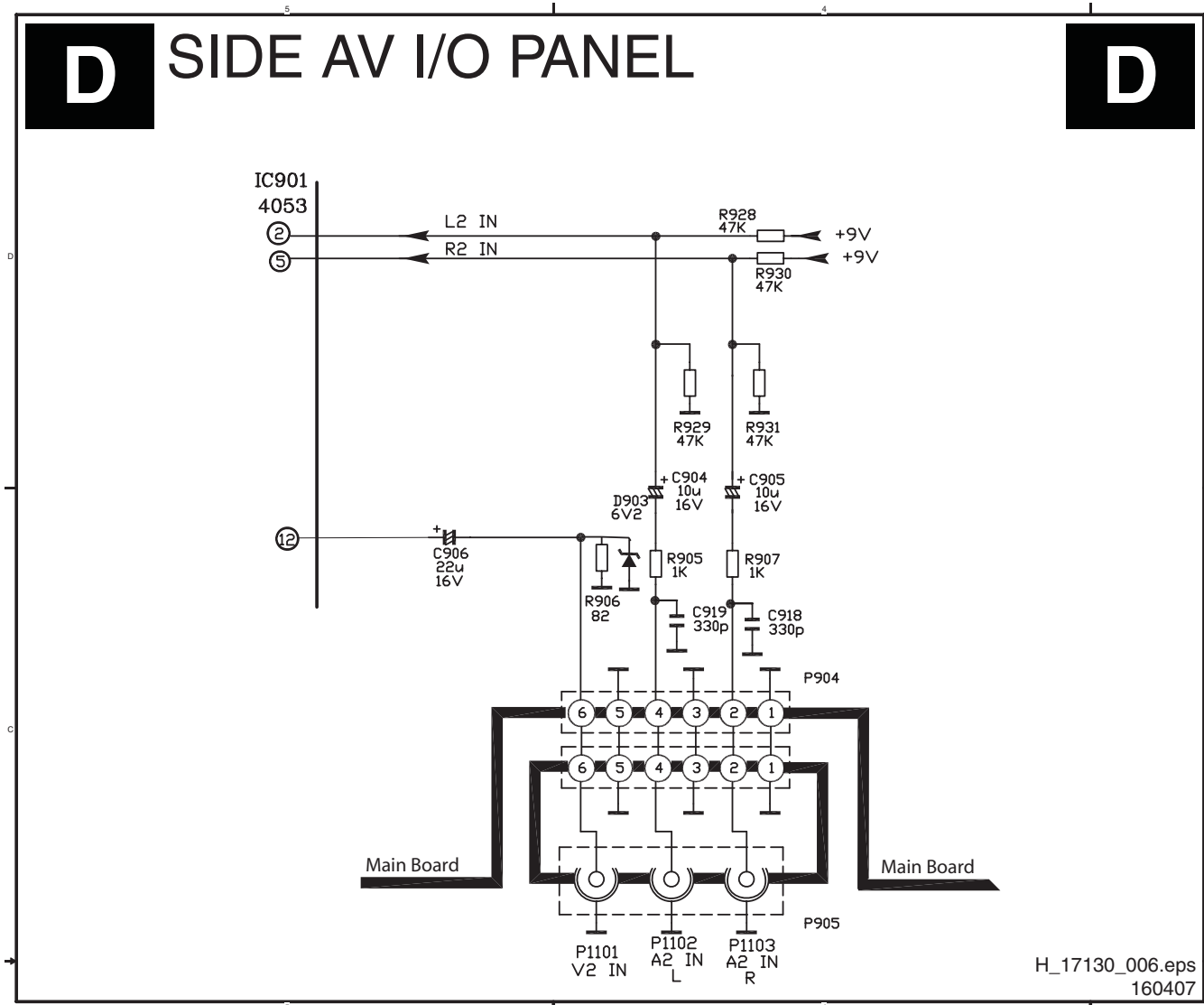
B



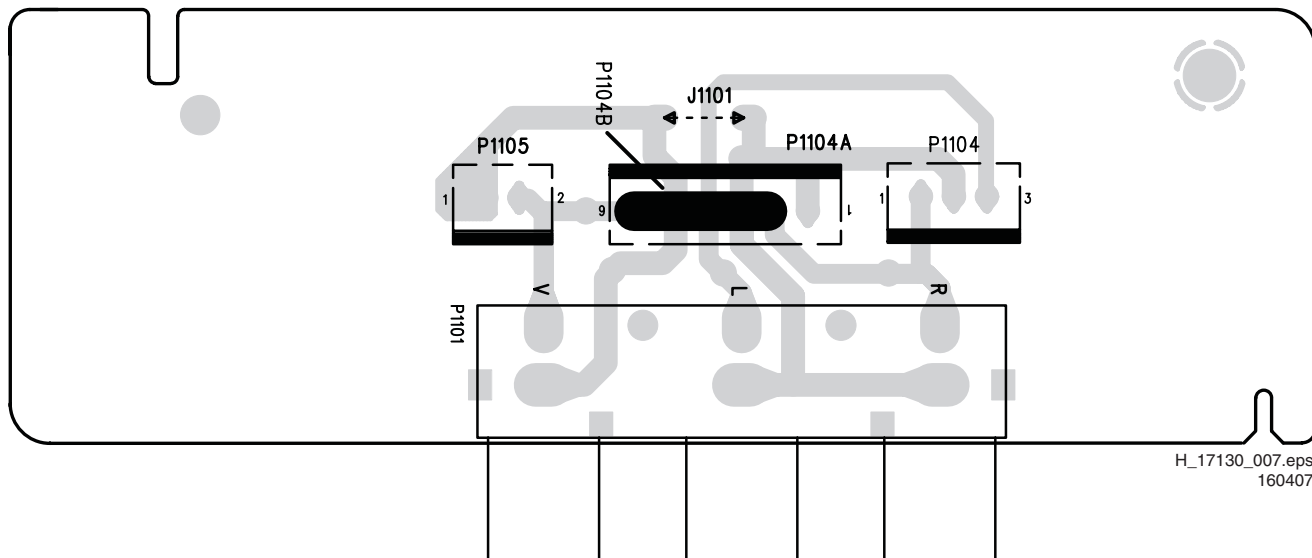
## Layout CRT Panel (Top Side)



## Side AV &amp; I/O Panel



## Layout Side AV &amp; I/O Panel (Top Side)





## 8. Alignments

### Index of this chapter:

- 8.1 General Information
- 8.2 Factory Mode (Service Menu, Service Mode)
- 8.3 Alignment procedure

**Note:** Figures below can deviate slightly from the actual situation, due to the different set executions.

### 8.1 General Information

Perform all electrical adjustments under the following conditions:

- Power supply voltage: 100 - 240 V<sub>AC</sub>, 50/60 Hz (± 10%)
- Connect the set to the mains via an isolation transformer with low internal resistance.
- Allow the set to warm up for approximately 15 minutes.
- Measure voltages and waveforms in relation to correct ground (e.g. measure audio signals in relation to AUDIO\_GND).
- **Caution:** It is not allowed to use heatsinks as ground.
- Test probe: R<sub>i</sub> > 10 Mohm, C<sub>i</sub> < 20 pF.
- Use an isolated trimmer/screwdriver to perform alignments.

### 8.2 Factory Mode (Service Menu, Service Mode)

For certain alignment procedures, you will need to enter Factory Mode (Service Menu). **See also figure “” on next page.**

#### 8.2.1 How To Enter

1. Press and hold the VOLUME DOWN key on the TV tightly until minimum level.
2. Then, while holding the VOLUME DOWN key, press the “DEL / [i+]” key on the remote control (RC).

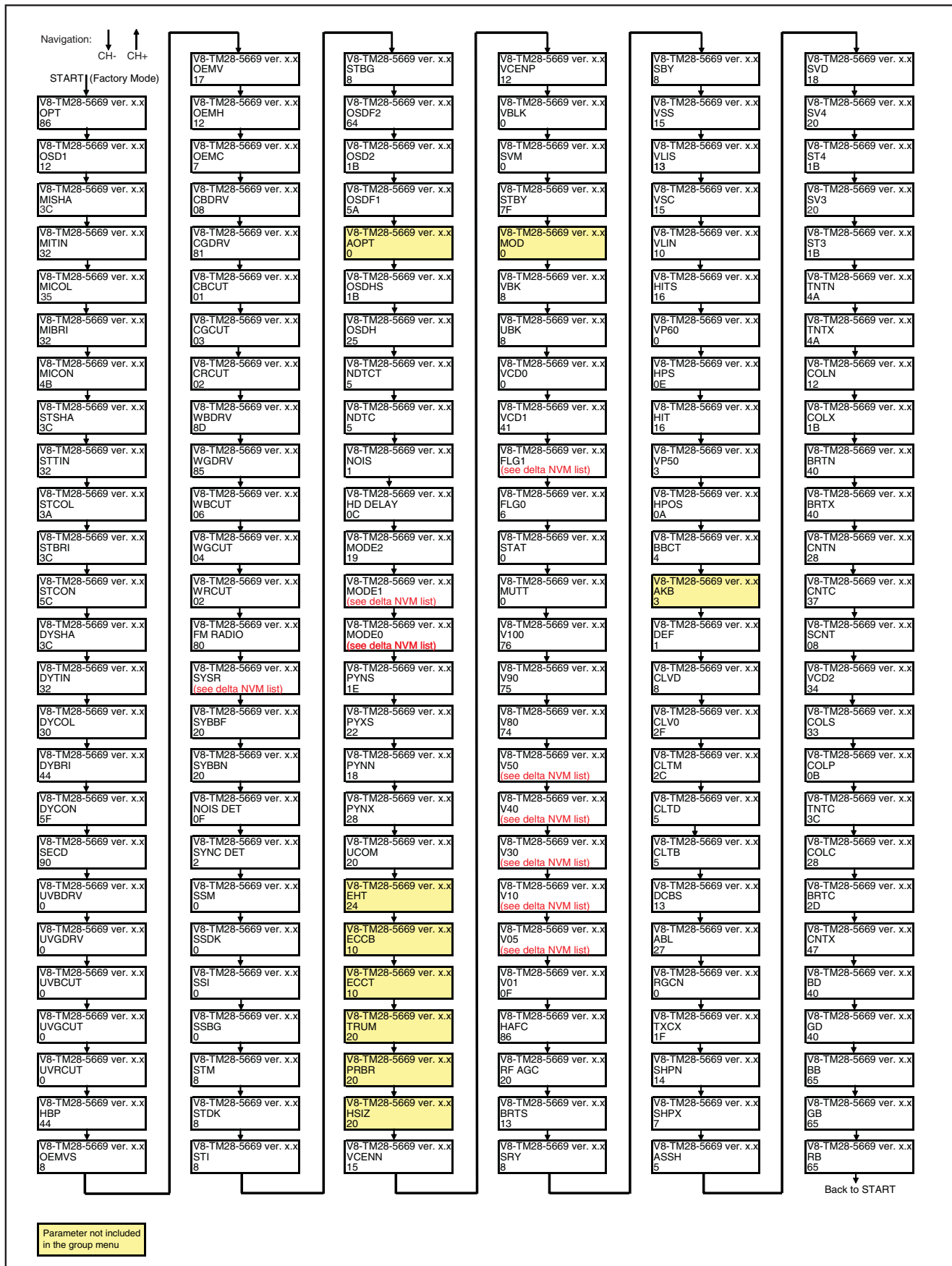
#### 8.2.2 How To Navigate

- Press “CH+ (^) / CH- (v)” cursor key on the RC to select option.
- Press “VOL- (<) / VOL+ (>)” cursor key on the RC to adjust or select option.
- Press “0-9” or “SOUND SYS” key on the RC as the shortcut key to directly access certain factory menu's (see figure “Group list overview”).
- All changes in factory data will be saved in EEPROM automatically.

#### 8.2.3 How To Exit

Press the RC “POWER / ⏻” button, or power down the set with the main switch, to exit the Factory Mode.

## 8.2.4 Factory Mode Overview



## 8.2.5 Group List Overview

<b>GROUP1</b>	<b>KEY 0</b>	<b>GROUP 7</b>	<b>KEY 7</b>
RB	R CUT OFF	RFAGC	RF AGC
GB	G CUT OFF	SBY	SECAM B-Y BLACK ADJUST
BB	B CUT OFF	SBY	SECAM R-Y BLACK ADJUST
GD	G DRIVE	BRTS	SUB BRIGHT shift data of BRTC
BD	B DRIVE	TXCX	TEXT RGB CONTRAST MAX
UBK	DVD U level adjustment 0: (-22mV, Input DC) 8: 0mV F: (19mV, 2.75mV/dev)	RGCN	TEXT RGB CONTRAST MIN
VBK	DVD V level adjustment Bits 4-7 Don't use	BBCT	SECAM MODE
<b>GROUP2</b>	<b>KEY 1</b>	<b>GROUP 9</b>	<b>KEY 8</b>
HPOS	Horizontal Position 50Hz	V01	VOLUME 01
HPS	Horizontal Position 60Hz	V05	VOLUME 05
HIT	Height 50Hz	V10	VOLUME 10
HITS	Height 60 Hz	V30	VOLUME 30
VP50	Vertical Position 50Hz	V40	VOLUME 40
VP60	Vertical Position 60Hz	V50	VOLUME 50
VLIN	V Linearity 50Hz	V70	VOLUME 70
VLIS	V Linearity 60Hz	V90	VOLUME 90
VSC	VS Correction 50Hz	V100	VOLUME 100
VSS	VS Correction 60Hz	<b>GROUP 10</b>	<b>KEY 9</b>
VBLK	V BLK Start / Stop	SVM	SVM
VCENP	V CENTERING 50Hz	PYNX	Normal H.SYNC max
VCENN	V CENTERING 60Hz	PYNN	Normal H.SYNC min
OSDH	OSD vertical position 50Hz	PYXS	Search H.SYNC max
OSDHS	OSD vertical position 60Hz	PYNS	Search H.SYNC min
<b>GROUP 3</b>	<b>KEY 3</b>	<b>GROUP 16</b>	<b>KEY 2</b>
CNTX	CONTRAST MAX	STBG	0-3 (S-Trap f0 for BG) [0: Sound Trap Off 1: f0 tuning min F: f0 tuning max] 4-7 (Don't use)
CNTN	CONTRAST MIN	STI	0-3 (S-Trap f0 for I) [0: Sound Trap Off 1: f0 tuning min F: f0 tuning max] 4-7 (Don't use)
BRTX	BRIGHT MAX. (difference from center)	STDK	0-3 (S-Trap f0 for DK) [0: Sound Trap Off 1: f0 tuning min F: f0 tuning max] 4-7 (Don't use)
BRTN	BRIGHT MIN. (difference from center)	STM	0-3 (S-Trap f0 for I) [0: Sound Trap Off 1: f0 tuning min F: f0 tuning max] 4-7 (Don't use)
COLX	COLOR MAX. (difference from center)	SSBG	0-1 - Sound Trap GD for BG [00: Off 01: 60nS 10: 90nS 11: 120nS] 2-3 - Sound Trap Q for BG [00: Q = 3 01: Q = 5 10: Q = 7 11: Q = 9] 4-5 - Sound Trap HP/LP for BG [00: Off 01: 1 dB HPF 10: -3 dB LPF 11: -2 dB LPF] 6-7 (Don't use)
COLN	COLOR MIN	SSI	0-1 - Sound Trap GD for I [00: Off 01: 60nS 10: 90nS 11: 120nS] 2-3 - Sound Trap Q for I [00: Q = 3 01: Q = 5 10: Q = 7 11: Q = 9] 4-5 - Sound Trap HP/LP for I [00: Off 01: 1 dB HPF 10: -3 dB LPF 11: -2 dB LPF] 6-7 (Don't use)
TINTX	TINT MAX. (difference from center)	SSDK	0-1 (Sound Trap GD for DK) [00: Off 01: 60nS 10: 90nS 11: 120nS] 2-3 (Sound Trap Q for DK) [00: Q = 3 01: Q = 5 10: Q = 7 11: Q = 9] 4-5 (Sound Trap HP/LP for DK) [00: Off 01: 1 dB HPF 10: -3 dB LPF 11: -2 dB LPF] 6-7 (Don't use)
TINTN	TINT MIN. (difference from center)	SSM	0-1 (Sound Trap GD for M) [00: Off 01: 60nS 10: 90nS 11: 120nS] 2-3 (Sound Trap Q for M) [00: Q = 3 01: Q = 5 10: Q = 7 11: Q = 9] 4-5 (Sound Trap HP/LP for M) [00: Off 01: 1 dB HPF 10: -3 dB LPF 11: -2 dB LPF] 6-7 (Don't use)
<b>GROUP 4</b>	<b>KEY 4</b>	<b>GROUP 17</b>	<b>Key SNDSYS</b>
BRTC	BRIGHT CENTER	NDTC	0-7 (Counter for non-weak signal detection) [0 - FF]
COLC	COLOR CENTER NTSC	NDTCT	0-7 (Counter for weak signal detection) [0 - FF]
COLS	COLOR CENTER SECAM	OEMC	0-2 (OEM Logo string color setting) [000: Black 001: use Red instead of Blue 010: Green 011: Cyan 100: Red 101: Magenda 110: Yellow 111: White] 3-7 (Don't use)
COLP	COLOR CENTER PAL (shift data from COLC)	OEMH	0-7 (H - offset value for OEM logo) [0 - FF]
SCNT	SUB CONTRAST	OEMV	0 - 7 (V - offset value for OEM logo in 50Hz system) [0 - FF]
CNTC	CONTRAST CENTER	OEMVS	0 - 7 (V - offset value for OEM logo in 60Hz system) [0 - FF]
TINTC	TINT CENTER	HBP	0 - 3 (H BOW) [0: -1uS 4: 0uS 7: 1uS] [0: +/-2 uS 4: 0 uS 7: +/-2 uS] 4-7 (H PARA)
<b>GROUP 5</b>	<b>KEY 5</b>		
ST3	SHARP CENTER 3.58NTSC TV		
SV3	SHARP CENTER 3.58NTSC VIDEO		
ST4	SHARP CENTER OTHER TV		
SV4	SHARP CENTER OTHER VIDEO		
SVD	SHARP CENTER DVD		
ASSH	ASYMMETRY-SHARPNESS		
SHPX	SHARP MAX. (difference from center)		
SHPN	SHARP MIN. (difference from center)		
<b>GROUP 6</b>	<b>KEY 6</b>		
OPT	OPTION DATA 0 D mode key 0: No use 1: use 1 0:normal 1: mute sound when no sync in TV 2 0:NORMAL 1: mute video during change channel 3 AU gain (0: 50kHz 1: 25kHz) 4 when no sync (1: AFT 0: no AFT) 5 AV change (1:mute 0:no mute) 6 Korea PAL50 blink function (1:enable 0:disable) 7 Standby state (0:High standby 1:Low standby)		
FLG0	0 Over MOD 1 N Buzz Cancel 2 Pin 56 function (1: AV1/AV2 0:Mute pin) 3 SLO f0 shift 4 Hotel mode TV mode enter 5 Hotel mode AV mode enter 6 Hotel mode 7 VCO readjust when position select (0:enable 1:disable)		
FLG1	0 (0: 6 key 1: 7 key) 1 OEM Logo (0: Use TCL Logo 1: Use OEM Logo) 2 Logo (0: disable 1: enable) 3 TINT por 4 PIF SELECT 00: 38MHz 01: 38.9MHz 5 10:45.75MHz 11:Don't Use 6 SECAM (0:disable 1:enable) 7 APC (0:Preset 1:Auto)		
STBY	0 Not Used 1 Not Used 2 HD kill timer set *40us 3 Not Used 4 When STBY.5=0 ,after AC on 0: standby 1: power on 5 After AC power on, 0: ref STBY4 1: last state 6 Biological Clock (0:disable 1:enable) 7 Child Lock (1:disable 0:enable)		
<b>HD DELAY</b>			
MODE0	0 FS/VS Select 0:VS TUNER 1:FS Tuner 1 English language select 2 Arabic language select /Thailand 3 Vietnam language select 4 Mute type 0: y mute 1: RGB mute 5 When mode0. (7 = 1 ; preset sound system after ASM) 6 00:BG 01:1 10:DK 11:M 7 Preset sound system after ASM (0:disable 1:enable)		
MODE1	0 BG system enable 1 I system enable 2 DK system enable 3 M system enable 4 Video2 enable 5 Video3 enable 6 YUV enable 7 Thailand Dual language 0:Disable 1:Enable		
MUTT	Standby -->wake time		
STAT	Contrast up timer after standby off		

Figure 8-2 Group list overview

### 8.2.6 Delta NVM Overview

Some option values depend on the model number. Please refer to table below for the deviations.

### Table 8-1 Delta NVM overview

[illegible]

### 8.3 Alignment procedure

Perform the alignments in the following sequence:

1. B+ voltage adjustment.
2. RF AGC adjustment.
3. Screen voltage and focus adjustment.
4. White balance adjustment.
5. Pin cushion and screen width adjustment.
6. Screen centre and size adjustment (PAL).
7. Screen centre and size adjustment (NTSC).

#### 8.3.1 B+ Voltage Test

1. Apply the specified mains voltage to the mains power input, and a standard test pattern to the RF input.
2. Not need to adjust, just for verification: with the TV settings in "Personal" mode (BRI/CONT/COL in middle position), test if the voltage at D833 (B+) is  $112\text{ V} \pm 2.0\text{ V}$ .

#### 8.3.2 RF AGC Adjustment

1. Input RF signal: 80 dB $\mu$ V Color Bar signal, 100% modulation (e.g. PM5418, RF Ampl.: 10 mV).
2. Press key "7" on the RC (in Factory Mode) to enter the RF AGC adjustment mode.
3. Adjust the "RFAGC" item until the output of the detector becomes  $0.6\text{ V}_{p-p} \pm 0.05\text{ V}$ .

#### 8.3.3 Focus and Screen Voltage Adjustment

1. Before adjusting, please confirm that the settings are:
  - Input signal: Cross Hatch test pattern
  - SMART PICTURE = NATURAL.
2. Adjust the "FOCUS" potentiometer on the LOT such that the horizontal/vertical line of 2/3 on the screen looks thinnest. The FOCUS voltage must be within 6.6 - 7.8 kV.
3. Then adjust the "SCREEN" potentiometer on the LOT until the horizontal line is just visible.
4. At this moment (vertical "off"), measure the VG2 voltage with a high voltage meter and high voltage test probe (1000:1). The VG2 voltage spec is  $570\text{ V} \pm 50\text{ V}$ .

#### 8.3.4 White Balance Adjustment

1. Before adjusting, please confirm that the settings are:
  - Input signal: Black and White test pattern
  - SMART PICTURE = NATURAL.
  - COLOR TEMP= NORMAL.
2. Press key "0" on the RC (in Factory Mode) to enter the White Balance adjustment mode.
3. Use a color analyser to measure the **Black** part of the screen. By changing the value of "BB" and "GB", set the reading of the color analyser to the x,y values as given in the next table.
4. Use a color analyser to measure the **White** part of the screen. By changing the value of "BD" and "GD", set the reading of the color analyser to the x,y values as given in the next table.
5. Repeat these steps until you get the right color on both dark and bright pictures (see next table).

Table 8-2 White balance adjustment values

Picture Mode	Color Temp.	x	y	Y (Nit)
Normal	11500K	274	280	90 (white), 5 (black)
Cool	15000K	265 *	266 *	
Warm	8500K	291 *	300 *	

Remarks:

- (\*) Only adjust the NORMAL status; the COOL and WARM offset adjustments are preset in the NVM.  
If necessary, the COOL adjustments can be performed

with "WRCUT", "WGCUT", "WBCUT", "WGDRV", and "WBDRV", while the WARM adjustments can be performed via "CRCUT", "CGCUT", "CBCUT", "CGDRV", and "CBDRV"

- When adjusting, "BB" and "GB" are used to adjust black balance, and "BD" and "GD" are used to adjust white balance.

#### 8.3.5 Picture geometric adjustment

##### For PAL

1. Input a PAL cross hatch pattern (in NATURAL status).
2. Press key "1" on the RC (in Factory Mode) to enter the Geometric adjustment.
3. Select "HPOS" to adjust the horizontal centre.
4. Select "VP50" to adjust the vertical centre.
5. Select "HIT" to adjust the vertical amplitude.
6. Select "VLIN" to adjust the vertical linearity.
7. Select "VSC" to adjust the vertical S-correction.

##### For NTSC

1. Input a NTSC cross hatch pattern (in NATURAL status).
2. Press key "1" on the RC (in Factory Mode) to enter the Geometric adjustment.
3. Select "HPS" to adjust the horizontal center.
4. Select "VP60" to adjust the vertical center.
5. Select "HITS" to adjust the vertical amplitude.
6. Select "VLIS" to adjust the vertical linearity.
7. Select "VSS" to adjust the vertical S-correction.

##### Adjustment of OSD Position

1. Navigate through the "Factory Mode" options with the "CH+ (^) / CH- (v)" cursor keys on the RC (see also figure "Factory Mode Overview").
2. Select the "OSD2" option and adjust the OSD horizontal position, until OSD "MUTE" is at the middle of the screen.

## 9. Circuit Descriptions, Abbreviation List, and IC Data Sheets

Index of this chapter:

- 9.1 General
- 9.2 Chassis Block Diagram
- 9.3 Brief IC Descriptions
- 9.4 Abbreviation List

Notes:

- Figures can deviate slightly from the actual situation, due to different set executions.
- For a good understanding of the following circuit descriptions, please use the Wiring, Block (chapter 6) and Circuit Diagrams (chapter 7). Where necessary, you will find a separate drawing for clarification.

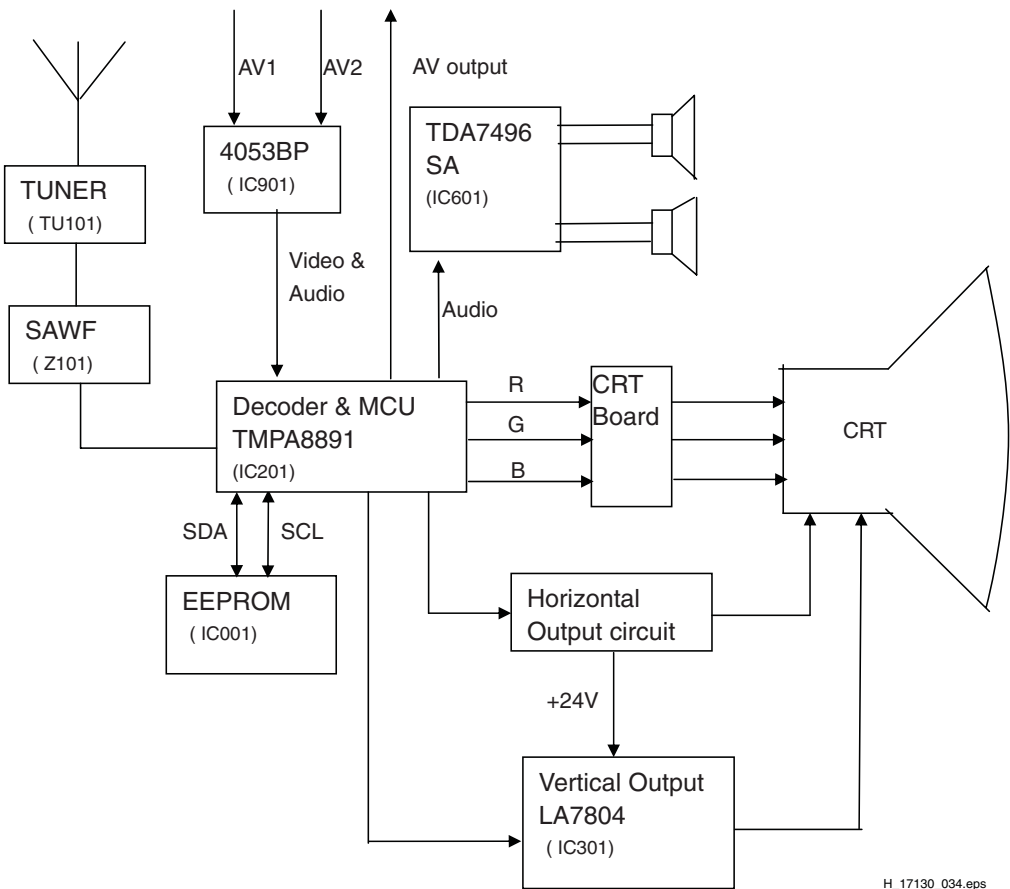
### 9.1 General

This chassis uses the Toshiba TPMA8891 processor/decoder, and has the following key components:

Item	Part No.	Name of IC	Function
IC201	13-PA8891-PSP	TMPA8891CXBNG	MCU & Decoder
TU101	07-389FI5-NA3G	FSBP05P-3-E	Tuner
Z101	45-SAW296-6M00G	K2966M	SAW Filter
IC001	13-24C08A-PUP27	AT24C08A	EEPROM
IC601	13-TDA749-6AS	TDA7496SA	Audio output amplifier
IC901	13-000040-53P	HCF4053B	Analog Switch
IC301	13-LA7804-0NS	LA78040N-E	Vertical Deflection Output IC
Q402	11-4508DZ-0CX	BU4508DZS	Horizontal Output IC
IC801	13-TEA150-6PP	TEA1506P	Power Controller IC

### 9.2 Chassis Block Diagram

Below find the chassis block diagram:



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Figure 9-1 Chassis block diagram



## 9.3 Brief IC Descriptions

### 9.3.1 IC201 (TMPA8891CXBNG)

The TMPA8891 is an integrated circuit for a PAL/ NTSC/ SECAM TV. A microcontroller (MCU) and a TV signal processor are integrated in a 64-pin shrink DIP package.

The MCU part contains:

- 8-bit CPU.
- ROM.
- RAM.
- I/O ports.
- Timers/ counters.
- A/D converters.
- On-Screen Display controller.
- remote control interfaces.
- IIC bus interfaces.
- Closed Caption decoder.

The TV signal processor part contains:

- PIF.
- SIF.
- Video.
- Multi-standard chroma.
- Sync.
- RGB processors.

Block diagram is as follows:

### Block Diagram & Pin Configuration

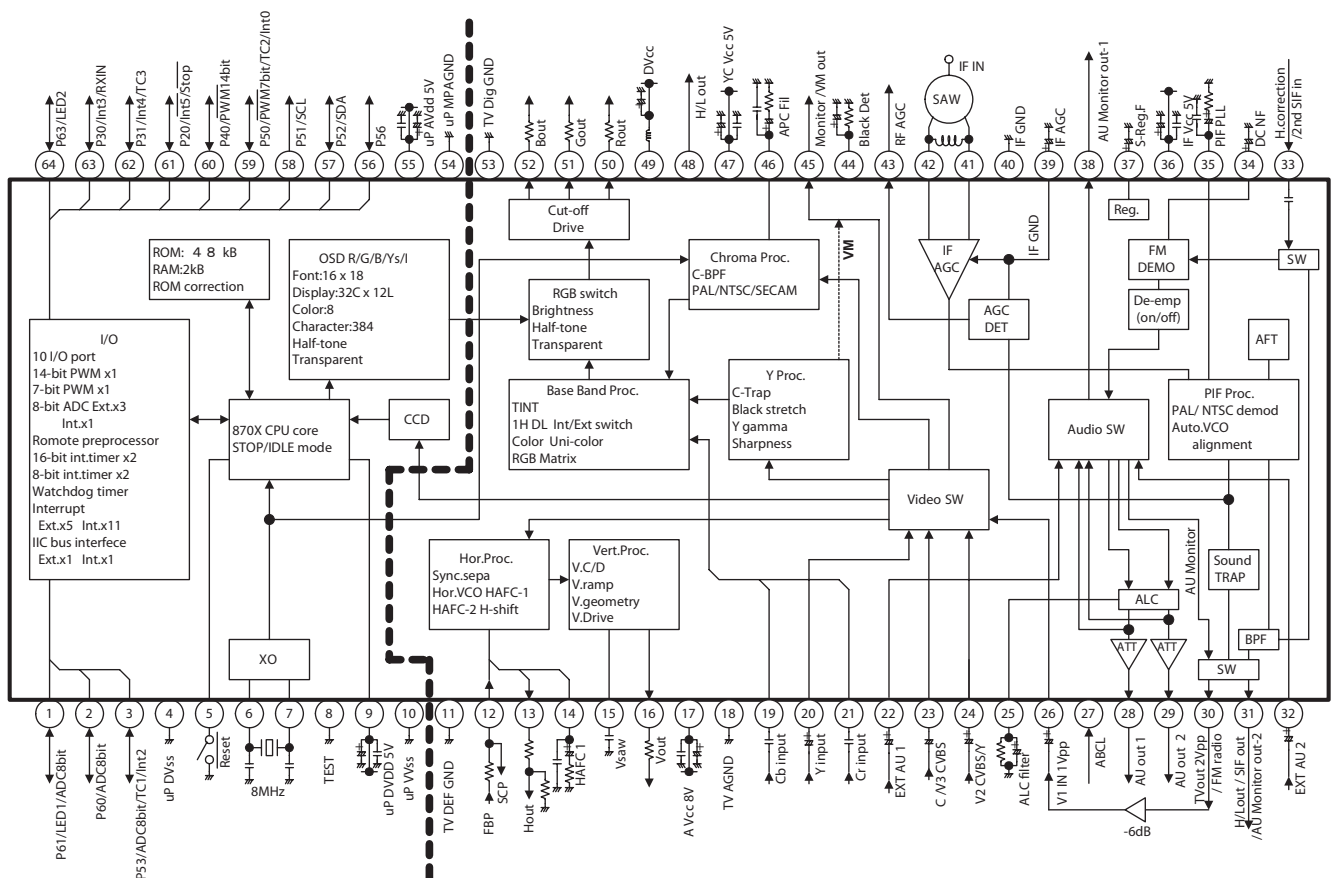


Figure 9-2 Block diagram IC201 (TMPA8891CXBNG)

9.3.2 TU101 (FSBP05P-3-E)

Intermediate frequency:

- Picture carrier: 38.90 MHz
- Color carrier: 34.47 MHz
- Sound carrier: 33.40 MHz

Pin connection is as follows:

Pin	Symbol	Description
1	AGC	Automatic Gain Control
2		
3	AS	I2C Bus Address Select
4	SCL	I2C Bus Serial Clock
5	SDA	I2C Bus Serial Data
6		
7	BP	Supply Voltage Tuner Section +5V
8	AFC	Automatic Frequency Control
9	BT	Supply Voltage Tuner Section +31V
10	n.c. / IF1	
11	IF2	Intermediate Frequency Out

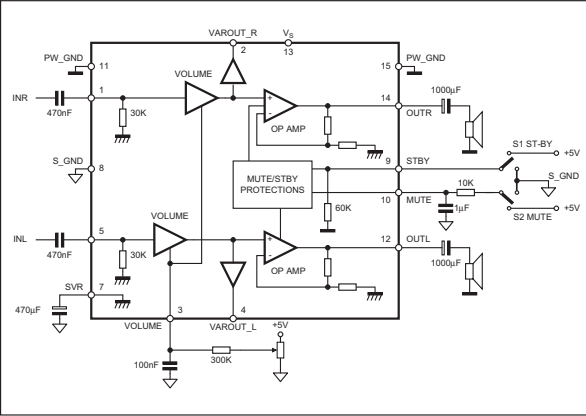
9.3.3 IC001 (AT24C08A)

It provides 8192 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 1024 words of 8 bits each. It needs to be pre-copied before produced.

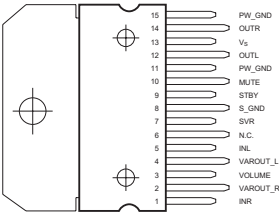
9.3.4 IC601 (TDA7496SA)

The TDA7496SA is a 2 x 5 W class AB power audio amplifier. The pinning is as follows:

Block Diagram



Pin Configuration (Top View)

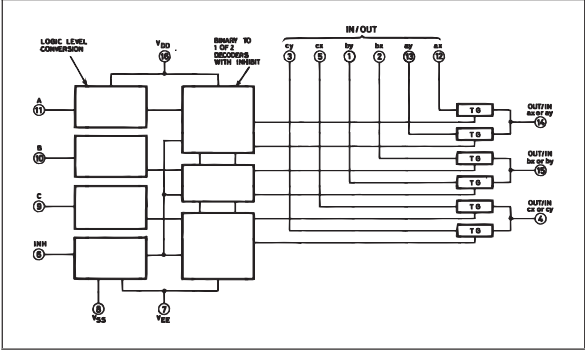


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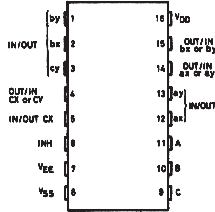
9.3.5 IC901 (HCF4053B)

This is an analogue switch. Its pinning diagram, pin description and truth table are as follows:

Block Diagram



Pin Configuration



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Figure 9-4 Block diagram and pinning of IC901 (HCF4053)

Table 9-1 Pin Configuration

PIN No	SYMBOL	NAME AND FUNCTION
11, 10, 9	A, B, C	Binary Control Inputs
6	INH	Inhibit Inputs
12, 13, 2, 1, 5, 3	IN/OUT	ax,ay,bx,by,cx,cy Input/Output
14	OUT/IN	ax or ay
15	OUT/IN	bx or by
4	OUT/IN	cx or cy
7	VEE	Supply Voltage
8	VSS	Negative Supply Voltage
16	VDD	Positive Supply Voltage

Table 9-2 Truth Table

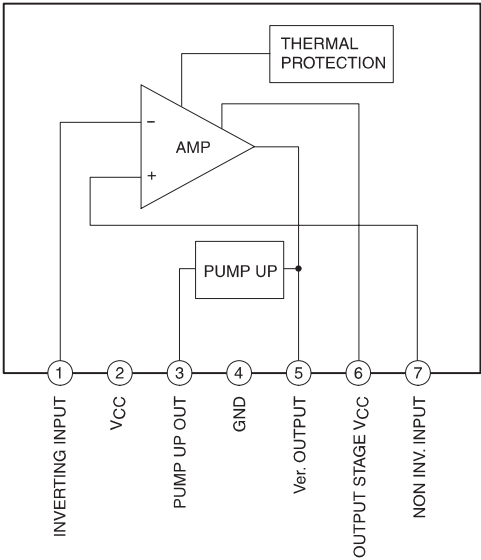
INHIBIT	C or B or A	
0	0	ax or bx or cx
0	1	ay or by or cy
1	X	NONE
X : Don't Care		

Figure 9-3 Block diagram and pinning of IC601 (TDA7496SA)

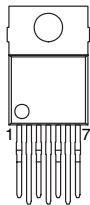
9.3.6 IC301 (LA78040N-E)

IC301 is a vertical deflection output IC.  
Its block diagram and pin connection are as follows:

Block Diagram



Pin Configuration



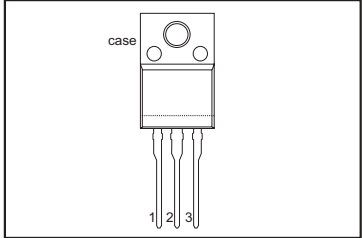
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Figure 9-5 Block diagram and pinning of IC301 (LA78040N-E)

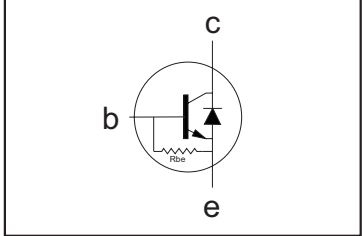
9.3.7 Q402 (BU4508DZS)

Q402 is a high speed switching, high voltage PNP power transistor with a built-in damper diode, designed for use in horizontal deflection circuits.  
The pinning is as follows:

PIN CONFIGURATION



PINNING SOT186A



SYMBOL

PIN	DESCRIPTION
1	base
2	collector
3	emitter
case	isolated

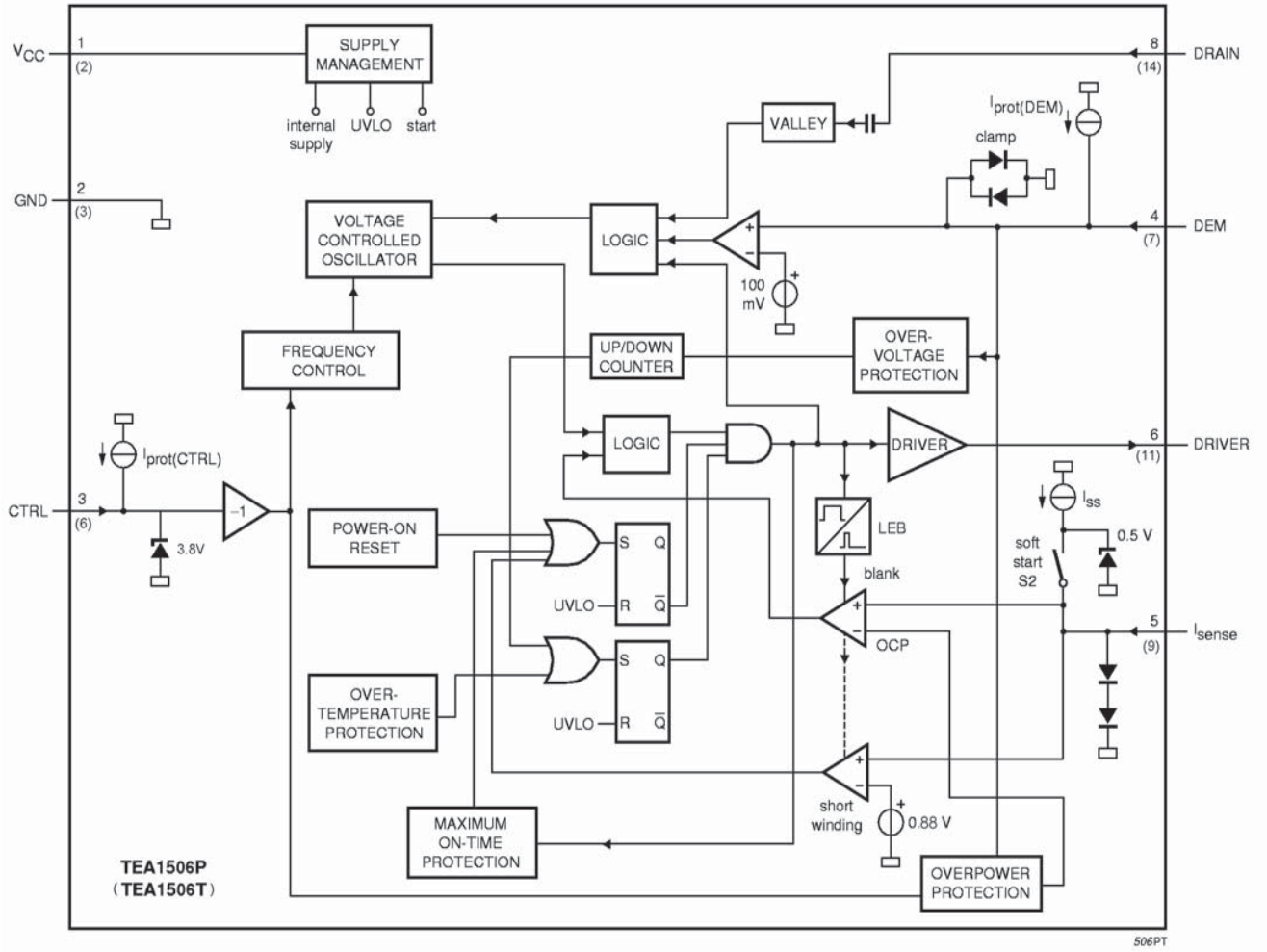
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Figure 9-6 Pinning of Q402 (BU4508DZS)

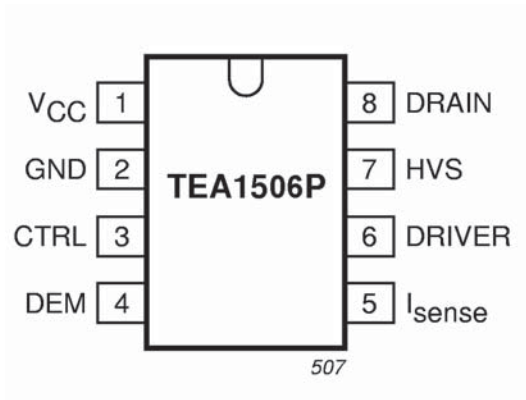
9.3.8 IC801 (TEA1506P)

IC801 is a switched mode power supply control IC.  
 Its block diagram and pinning are as follows:

Block Diagram



Pin Configuration



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Figure 9-7 Block diagram of IC801 (TEA1506P)







## 9.4 Abbreviation List

1080i	1080 visible lines, interlaced		carrier = 4.433619 MHz) and South America (color carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
1080p	1080 visible lines, progressive scan		
ADC	Analogue to Digital Converter	PCB	Printed Circuit Board (or PWB)
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency	PIP	Picture In Picture
		PLL	Phase Locked Loop. Used, for example, in FST tuning systems. The customer can directly provide the desired frequency
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box	PSU	Power Supply Unit
AM	Amplitude Modulation	PWB	Printed Wiring Board (or PCB)
AR	Aspect Ratio: 4 by 3 or 16 by 9	RAM	Random Access Memory
AV	Audio Video	RC	Remote Control transmitter
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz	RC5 (6)	Remote Control system 5 (6), the signal from the remote control receiver
BTSC	Broadcast Television System Committee	RF	Radio Frequency
CBA	Circuit Board Assembly (or PWB)	RGB	Red, Green, and Blue. The primary color signals for TV. By mixing levels of R, G, and B, all colors (Y/C) are reproduced.
CVBS	Composite Video Blanking and Synchronization		
CVI	Component Video Input	RGBHV	Red, Green, Blue, Horizontal sync, and Vertical sync
DAC	Digital to analogue Converter	ROM	Read Only Memory
DFU	Directions For Use: owner's manual	SC	SandCastle: two-level pulse derived from sync signals
DNR	Dynamic Noise Reduction	S/C	Short Circuit
DRAM	Dynamic RAM	SCL	Clock signal on I2C bus
DSP	Digital Signal Processing	SD	Standard Definition: 480i, 576i
DVD	Digital Versatile Disc	SDA	Data signal on I2C bus
EEPROM	Electrically Erasable and Programmable Read Only Memory	SDRAM	Synchronous DRAM
EXT	EXTernal (source), entering the set by SCART or by cinches (jacks)	SECAM	SEquence Couleur Avec Memoire. Color system used mainly in France and Eastern Europe. Color carriers = 4.406250 MHz and 4.250000 MHz
FBL	Fast Blanking: DC signal accompanying RGB signals		
FM	Field Memory / Frequency Modulation	SIF	Sound Intermediate Frequency
H	H_sync	SMPS	Switch Mode Power Supply
HD	High Definition: 720p, 1080i, 1080p	SND	Sound
HP	Head Phone	SOPS	Self Oscillating Power Supply
I	Monochrome TV system. Sound carrier distance is 6.0 MHz	SRAM	Static RAM
I2C	Integrated IC bus	SSB	Small Signal Board
IC	Integrated Circuit	STBY	Stand-by
IF	Intermediate Frequency	SVHS	Super Video Home System
IR	Infra Red	SW	Sub Woofer / SoftWare / Switch
IRQ	Interrupt ReQuest	THD	Total Harmonic Distortion
Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes	TXT	TeleteXT
		uP	Microprocessor
		VL	Variable Level out: processed audio output toward external amplifier
		VCR	Video Cassette Recorder
LATAM	LATin America	VGA	Video Graphics Array
LED	Light Emitting Diode	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
LS	Loud Speaker		
M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz	XTAL	Quartz crystal
MOSFET	Metal Oxide Semiconductor Field Effect Transistor	YPbPr	Component video (Y= Luminance, Pb/Pr= Color difference signals B-Y and R-Y, other amplitudes w.r.t. to YUV)
MUTE	MUTE Line		
NAFTA	North American Free Trade Association: Trade agreement between Canada, USA and Mexico	Y/C	Video related signals: Y consists of luminance signal, blanking level and sync; C consists of color signal.
NC	Not Connected		
NTSC	National Television Standard Committee. Color system used mainly in North America and Japan. Color carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)	Y-OUT	Luminance-signal
		YUV	Baseband component video (Y= Luminance, U/V= Color difference signals)
NVM	Non Volatile Memory: IC containing TV related data (for example, options)		
O/C	Open Circuit		
OSD	On Screen Display		
PAL	Phase Alternating Line. Color system used mainly in Western Europe (color		

# 10. Spare Parts List

Set Level								
21PT5007/94								
P401H	9965 100 04136	HS 4P 400/13 TJC1/4Y	C216	9965 000 14039	4.7μF 20% 50V	C834	9965 100 03194	1μ 50V
P601H	9965 100 04134	HS 2P 2468 S11/2Y	C217	9965 000 14599	470μF 20% 16V	C835	9965 000 31230	100μF 20% 160V
P602H	9965 100 04133	HS 2P22 570/7 TJC3-2Y	C218	9965 000 15088	0.47μF 20% 50V	C837	9965 000 15806	0.1μF +80-20% 50V
OTH003	9965 100 02991	Degaussing Coil	C219	9965 000 30711	1000pF 20% 50V	C839	9965 000 30711	1000pF 20% 50V
OTH009	9965 000 41238	Chassis Guide	C220	9965 000 27860	10μF /-20% 16V	C841	9965 000 15183	220pF 500V 10%
OTH013	9965 100 04135	LOGO	C224	9965 000 15099	0.01μF +80%~-20% 50V	C842	9965 000 15099	0.01μF +80%~-20% 50V
OTH036	9965 100 01107	Audio Cable 1500mm	C227	9965 000 27860	10μF /-20% 16V	C843	9965 000 17510	1000μF 16V 20%
OTH056	9965 000 26496	CRT Bracket	C228	9965 000 15099	0.01μF +80%~-20% 50V	C844	9965 000 33957	10nF 5% 50V
OTH091	9965 000 35209	Conn .310431103011	C230	9965 100 03106	RES. C.F. 1M OHM 1/6W	C845	9965 000 14067	1000μF 20% 16V
W601	9965 000 36789	Loudsp. 8Ω 5W	C231	9965 000 27860	10μF /-20% 16V	C850	9965 000 15182	47μF 20% 25V
W602	9965 000 36789	Loudsp. 8Ω 5W	C232	9965 000 14070	220μF 20% 16V	C903	9965 000 15084	22μF 20% 16V
			C233	9965 000 15099	0.01μF +80%~-20% 50V	C904	9965 000 27860	10μF /-20% 16V
			C234	9965 000 27872	0.1μF 5% 100V	C905	9965 000 27860	10μF /-20% 16V
			C235	9965 000 17886	0.0082μF 5% 63V	C906	9965 000 15084	22μF 20% 16V
			C236	9965 000 34501	0.47μF 10%	C907	9965 000 27860	10μF /-20% 16V
			C239	9965 000 15099	0.01μF +80%~-20% 50V	C908	9965 000 27860	10μF /-20% 16V
			C242	9965 000 15088	0.47μF 20% 50V	C909	9965 000 15084	22μF 20% 16V
			C273	9965 000 13961	47μF 20% 16V	C910	9965 000 15099	0.01μF +80%~-20% 50V
			C301	9965 000 15112	0.1μF 5% 50V	C912	9965 000 15099	0.01μF +80%~-20% 50V
			C302	9965 100 03161	220μF 20% 35V	C913	9965 000 15690	330pF 5% 50V
			C303	9965 000 14598	100μF 20% 35V	C914	9965 000 15690	330pF 5% 50V
			C304	9965 000 35325	10pPF 5% 50V	C916	9965 000 14037	1μF 20% 50V
			C305	9965 000 15084	22μF 20% 16V	C918	9965 000 15690	330pF 5% 50V
			C306	9965 000 30711	1000pF 20% 50V	C919	9965 000 15690	330pF 5% 50V
			C307	9965 000 14039	4.7μF 20% 50V	C931	9965 000 15099	0.01μF +80%~-20% 50V
			C308	9965 000 22932	1000pμF 20% 25V	C961	9965 000 27860	10μF /-20% 16V
			C309	9965 000 15112	0.1μF 5% 50V	C962	9965 000 27860	10μF /-20% 16V
			C310	9965 000 14039	4.7μF 20% 50V	C963	9965 000 14037	1μF 20% 50V
			C311	9965 000 14069	100μF 20% 16V	C964	9965 000 14037	1μF 20% 50V
			C337	9965 000 15088	0.47μF 20% 50V			
			C401	9965 000 15094	1000pF 10% 500V			
			C402	9965 000 17517	0.011μF 5% 1.6kV			
			C404	9965 100 03127	47Ω 5% 1/6W			
			C405	9965 000 14036	100μF 20% 25V	R001	9965 000 14050	10k 5% 0.16W
			C407	9965 000 15095	3300pF 10% 500V	R0010	9965 100 03127	47Ω 5% 1/6W
			C408	9965 000 14921	10μF 20% 250V	R002	9965 100 03127	47Ω 5% 1/6W
			C409	9965 000 15096	390pF 10% 500V	R003	9965 000 15057	4.7k 5% 0.16W
			C410	9965 100 03162	CAP. M.PP 0.1 UF 250V	R004	9965 000 15057	4.7k 5% 0.16W
			C411	9965 000 17512	47μF 20% 160V	R005	9965 000 14050	10k 5% 0.16W
			C412	9965 000 15096	390pF 10% 500V	R008	9965 000 14049	100Ω 5% 0.16W
			C413	9965 000 14073	470μF 20% 35V	R012	9965 000 14049	100Ω 5% 0.16W
			C414	9965 000 14039	4.7μF 20% 50V	R013	9965 100 02999	1kΩ 5% 1/6W
			C418	9965 000 14070	220μF 20% 16V	R015	9965 100 03121	2.7kΩ 5% 1/6W
			C420	9965 000 24353	1μF 20% 160V	R016	9965 100 03107	1.2kΩ 5% 1/6W
			C421	9965 100 03163	0.3μF 5% 250V	R017	9965 000 13957	2.2kΩ 5% 1/6W
			C422	9965 000 14081	5600pF 5% 50V	R020	9965 000 13960	470Ω 5% 0.16W
			C423	9965 000 13961	47μF 20% 16V	R021A	9965 100 03110	150Ω 5% 1/6W
			C425	9965 000 15099	0.01μF +80%~-20% 50V	R022A	9965 000 13960	470Ω 5% 0.16W
			C441	9965 000 14039	4.7μF 20% 50V	R023A	9965 000 17864	820Ω 5% 0.16W
			C601	9965 000 15113	220nF 5% 50V	R024A	9965 000 15062	7.5kΩ 50% 1/6W
			C602	9965 000 15113	220nF 5% 50V	R025A	9965 100 03121	2.7kΩ 5% 1/6W
			C603	9965 000 15117	4700pF 5% 50V	R026A	9965 100 03126	430Ω 50% 1/6W
			C604	9965 000 15117	4700pF 5% 50V	R027	9965 000 15066	10Ω 5% 0.25W
			C605	9965 000 14599	470μF 20% 16V	R027A	9965 000 15050	270Ω 5% 0.16W
			C606	9965 000 14599	470μF 20% 16V	R028	9965 100 03000	680Ω 5% 1/6W
			C607	9965 000 14599	470μF 20% 16V	R029	9965 100 02999	1kΩ 5% 1/6W
			C608	9965 000 14599	470μF 20% 16V	R030	9965 000 14050	10k 5% 0.16W
			C609	9965 000 14599	470μF 20% 16V	R031	9965 000 15041	100k 5% 0.16W
			C618	9965 100 03088	22μF 20% 50V	R035	9965 100 02999	1kΩ 5% 1/6W
			C619	9965 000 14073	470μF 20% 35V	R041	9965 000 15057	4.7k 5% 0.16W
			C624	9965 000 28015	22μF 20% 50V	R042	9965 000 14050	10kΩ5% 0.16W
			C625	9965 000 14069	100μF 20% 16V	R046	9965 100 03123	30kΩ 5% 1/6W
			C626	9965 000 35326	0.1μF 80%20% 50V	R047	9965 000 14049	100Ω 5% 0.16W
			C635	9965 000 13961	47μF 20% 16V	R091	9965 000 14050	10kΩ 5% 0.16W
			C641	9965 000 27860	10μF /-20% 16V	R092	9965 000 15057	4.7k 5% 0.16W
			C642	9965 000 27860	10μF /-20% 16V	R093	9965 000 15057	4.7k 5% 0.16W
			C801	9965 000 35331	0.22μF 20% 250V	R094	9965 000 15044	1.5k 5% 0.16W
			C802	9965 100 03199	0.1μF 10% 400V	R095	9965 000 14050	10k 5% 0.16W
			C803	9965 000 17914	470pF 10% 400V	R114	9965 100 03140	56Ω 5% 1/6W
			C804	9965 000 17914	470pF 10% 400V	R115	9965 100 03110	150Ω 5% 1/6W
			C805	9965 000 44381	10nF 10% 500V	R116	9965 100 02999	1kΩ 5% 1/6W
			C806	9965 000 40946	220μF 20% 450V	R117	9965 100 03110	150Ω 5% 1/6W
			C807	9965 000 15188	4700pF 250Vac +80-20%	R118	9965 000 17864	820Ω 5% 0.16W
			C808	9965 000 15188	4700pF 250Vac +80-20%	R119	9965 000 13960	470Ω 5% 0.16W
			C809	9965 000 23786	220pF 5% 1KV	R201	9965 100 03114	220Ω 5% 1/6W
			C810	9965 100 03198	CAP.M.PP.10NF/400V	R202	9965 100 03114	220Ω 5% 1/6W
			C811	9965 100 03197	47nF 80% 50V	R203	9965 100 03114	220Ω 5% 1/6W
			C813	9965 000 31199	470pF 5% 50V	R205	9965 100 03123	30kΩ 5% 1/6W
			C814	9965 000 15806	0.1μF +80-20% 50V	R206	9965 100 03120	220kΩ 5% 1/6W
			C815	9965 000 37248	560pF 10% 2kV	R207	9965 100 03127	47Ω 5% 1/6W
			C818	9965 100 03088	22μF 20% 50V	R216	9965 000 27858	27kΩ 5% 1/6W
			C820	9965 100 03193	22μF 20% 25V	R217	9965 100 03114	220Ω 5% 1/6W
			C821	9965 000 31455	220pF 5% 50V	R228	9965 000 13960	470Ω 5% 0.16W
			C826	9965 000 44381	10nF 10% 500V	R232	9965 000 15041	100k 5% 0.16W
			C829	9965 100 03195	2200pF 20% 400VAC	R237	9965 100 03146	8.2kΩ 5% 1/6W
			C830	9965 000 15183	220pF 500V 10%	R238	9965 000 13960	470Ω 5% 0.16W
			C831	9965 000 15099	0.01μF +80%~-20% 50V	R243	9965 000 13960	470Ω 5% 0.16W
			C832	9965 000 14073	470μF 20% 35V	R244	9965 000 15057	4.7k 5% 0.16W
			C833	9965 000 23786	220pF 10% 1KV	R245	9965 000 23744	150kΩ 5% 0.17W
						R298	9965 100 03152	330Ω 1/2W



R307	9965 100 03113	18kΩ 5% 1/6W	R940	9965 000 15062	7.5kΩ 50% 1/6W		
R308	9965 000 15057	4.7k 5% 0.16W	R941	9965 100 02999	1kΩ 5% 1/6W		
R309	9965 000 14050	10k 5% 0.16W	R963	9965 100 02999	1kΩ 5% 1/6W		
R310	9965 100 03109	12kΩ 5% 1/6W	R964	9965 100 02999	1kΩ 5% 1/6W		
R311	9965 000 15044	1.5k 5% 0.16W	RT801	9965 000 25706	PTC 9 OHM	IC001	9965 100 03103 AT24C08A-10PU-2.7
R312	9965 100 03139	51kΩ 1/6W	VR801	9965 000 24388	Varistor Res Myg-14k300	IC201	9965 100 03105 TMPA8891CXBNG
R313	9965 100 03159	1.5Ω 1W	J103	9965 000 14049	100Ω 5% 0.16W	IC301	9965 100 03104 LA78040N-E
R314	9965 100 03147	RES. C.F. 2.2 OHM 1/4W				IC402	9965 100 03102 L7805CV
R317	9965 100 03153	RES. C.F. 56 OHM 1/2W				IC601	9965 100 03004 IC TDA7496SA
R318	9965 100 03107	1.2kΩ 5% 1/6W				IC801	9965 100 03179 TEA1506P
R336	9965 100 03149	220Ω 1/2W				IC802	9965 100 03178 HPC922-C
R337	9965 000 15041	100k 5% 0.16W	L001	9965 100 03164	12μH +/-5%	IC803	9965 100 03177 TL431ACLP
R338	9965 000 15041	100k 5% 0.16W	L002	9965 000 15123	10μH 5%	IC901	9965 100 03101 4053 (ANALOG SW)
R401	9965 000 17494	120Ω 5% 1/6W	L080	9965 000 15126	33μH 5%	Q002	9965 100 03003 2SC1815-Y
R402	9965 100 03148	5.6Ω 5% 1/2W	L103	9965 000 15121	1μH 10%	Q003	9965 100 02997 ST2SA1015Y (PNP)
R403	9965 000 24352	0.47Ω 5% 1W	L108	9965 000 15124	22μH 5%	Q005	9965 100 02997 ST2SA1015Y (PNP)
R404	9965 000 15409	15kΩ 5% 2W	L202	9965 000 15126	33μH 5%	Q093	9965 100 03003 2SC1815-Y
R405	9965 100 03155	1.5Ω 5% 1W	L203	9965 100 03165	Bead BF-135050R-730	Q095	9965 100 03003 2SC1815-Y
R406	9965 000 15057	4.7kΩ 5% 0.16W	L208	9965 000 15124	22μH 5%	Q097	9965 100 03003 2SC1815-Y
R407	9965 100 03160	3.3Ω 5% 2W	L411	9965 100 03168	Coil Width 92μH	Q101	9965 000 14974 2SC3779D
R408	9965 000 17869	12k 5% 1W	L412	9965 100 03167	Coil Linearity 45μH	Q202	9965 100 03003 2SC1815-Y
R409	9965 100 03149	220Ω 1/2W	L815	9965 000 24357	Bead H75 (3.5X1X5)	Q208	9965 100 03003 2SC1815-Y
R410	9965 100 03151	22kΩ 1/2W	L830	9965 000 24357	Bead H75 (3.5X1X5)	Q210	9965 100 02997 ST2SA1015Y (PNP)
R411	9965 100 03158	1.8kΩ 5% 1W	L833	9965 100 03165	Bead BF-135050R-730	Q401	9965 100 03100 2SC2235-Y(NPN)
R413	9965 000 14048	10Ω 5% 1/6W	L834	9965 000 15193	100μH 10%	Q402	9965 100 03099 BU450DZ
R414	9965 000 15049	24kΩ 5% 1/6W	L835	9965 100 03165	Bead BF-135050R-730	Q405	9965 100 02997 ST2SA1015Y (PNP)
R415	9965 100 02999	1kΩ 5% 1/6W	L840	9965 000 24357	24357	Q624	9965 100 03003 2SC1815-Y
R416	9965 100 03142	6.8kΩ 5% 1/6W	L843	9965 000 15193	100μH 10%	Q625	9965 100 02997 ST2SA1015Y (PNP)
R417	9965 100 03157	1.2kΩ 5% 1/2W	T401	9965 100 03166	Transf. Hor. BCT-101	Q801	9965 100 02997 ST2SA1015Y (PNP)
R418	9965 100 03156	1kΩ 5% 1/2W	T402	9965 100 03170	FBT BSC25-0220w	Q802	9965 100 03003 2SC1815-Y
R419	9965 100 03154	2.2Ω 5% 1/2W	T801	9965 100 03202	Line Filter	Q815	9965 100 03176 2SK2645-01MR
R440	9965 000 14048	10Ω 5% 1/6W	T803	9965 100 03203	Transf. Conv. BCK4035	Q841	9965 100 03003 2SC1815-Y
R442	9965 000 17494	120Ω 5% 1/6W				Q842	9965 100 03003 2SC1815-Y
R443	9965 100 03141	620Ω 5% 1/6W				Q843	9965 100 03175 2SD2012
R601	9965 000 15057	4.7k 5% 0.16W				Q844	9965 100 03003 2SC1815-Y
R602	9965 000 15057	4.7k 5% 0.16W				Q845	9965 100 03003 2SC1815-Y
R603	9965 000 14050	10k 5% 0.16W	D001	9965 100 03096	Zener 5% 4V7 1/2W	Q903	9965 100 03003 2SC1815-Y
R604	9965 000 14050	10k 5% 0.16W	D001A	9965 000 32018	LED 932205099682	Q904	9965 100 03003 2SC1815-Y
R607	9965 000 14050	10k 5% 0.16W	D002	9965 100 02996	1N4148 (Switching)	Q905	9965 100 03003 2SC1815-Y
R608	9965 000 14050	10k 5% 0.16W	D005	9965 100 02996	1N4148 (Switching)	<b>CRT Panel</b>	
R619	9965 000 22921	0.22Ω 1W	D006	9965 100 02996	1N4148 (Switching)		
R802	9965 000 15177	1MΩ 1/2W	D007	9965 100 02996	1N4148 (Switching)		
R803	9965 100 03192	NTC.RES 3D2-14	D008	9965 000 13957	2.2kΩ 5% 1/6W	<b>Various</b>	
R804	9965 100 03190	Metal Film 1WS 330kΩ	D009	9965 000 15818	BZX79-C6V2	P501	9965 100 04137 HS 5P24 500 TJC3-5Y/SCN-5Y
R806	9965 000 17557	DSP-301M-A	D010	9965 000 15818	BZX79-C6V2	P502	9965 100 04138 HS 4P24 460 F/W TJC3-4Y/SCN-4
R807	9965 000 25987	220Ω 10% 1/2W	D011	9965 000 15818	BZX79-C6V2	OTH027	9965 000 34422 CRT Sock. GZS10-2-108
R810	9965 000 30822	68kΩ 5% 2W	D012	9965 100 03097	Zener 5V1 1/2W 5%		
R811	9965 100 03107	1.2kΩ 5% 1/6W	D020A	9965 100 03090	BAT85 (Switch.)		
R813	9965 100 03187	100Ω 5% 1/4W	D090	9965 000 15817	3V9 1/2W 5%		
R814	9965 000 14048	10Ω 5% 1/6W	D091	9965 100 02996	1N4148 (Switching)	C501	9965 000 31199 470pF 5% 50V
R815	9965 100 03191	0.08Ω 5% 2W	D092	9965 100 02996	1N4148 (Switching)	C502	9965 000 31199 470pF 5% 50V
R817	9965 000 15664	2.2kΩ 5% 1/4W	D093	9965 100 02996	1N4148 (Switching)	C503	9965 000 31199 470pF 5% 50V
R818	9965 000 14055	33kΩ 5% 1/6W	D094	9965 100 02996	1N4148 (Switching)	C504	9965 000 44381 10nF 10% 500V
R819	9965 100 03184	330kΩ 5% 1/6W	D102	9965 100 03098	Diode CW574CD	C505	9965 000 44382 1000pF 10% 2kV
R820	9965 000 14059	22Ω 5% 0.25W	D206	9965 100 02996	1N4148 (Switching)	C507	9965 000 15099 0.01μF +80%~-20% 50V
R821	9965 000 13960	470Ω 5% 0.16W	D207	9965 000 15818	BZX79-C6V2	C508	9965 000 14070 220μF 20% 16V
R822	9965 100 03185	390kΩ 1/6W	D301	9965 100 03094	1N4001 (Rectifier)	C514	9965 000 14925 Bead BF60 for C508
R829	9965 000 15781	8.2MΩ 1W	D302	9965 100 02996	1N4148 (Switching)	C514	9965 000 35317 10nF 20/80%
R835	9965 100 03000	680Ω 5% 1/6W	D303	9965 100 02996	1N4148 (Switching)		
R836	9965 000 13957	2.2kΩ 5% 1/6W	D304	9965 000 15817	3V9 1/2W 5%		
R837	9965 000 14055	33kΩ 5% 1/6W	D305	9965 100 02996	1N4148 (Switching)		
R838	9965 100 03188	RES. M.F. 3.6K OHM 1/6	D306	9965 100 02996	1N4148 (Switching)	R501	9965 000 14049 100Ω 5% 0.16W
R839	9965 000 23773	82kΩ 1% 0.5W	D307	9965 100 02996	1N4148 (Switching)	R502	9965 000 15057 4.7k 5% 0.16W
R840	9965 000 14050	10k 5% 0.16W	D337	9965 100 02996	1N4148 (Switching)	R503	9965 000 17938 750Ω 5% 0.16W
R841	9965 000 14585	47kΩ 5% 1/6W	D338	9965 100 02996	1N4148 (Switching)	R504	9965 000 14049 100Ω 5% 0.16W
R842	9965 000 44690	3.9kΩ 1% 1/6W	D401	9965 100 03091	FR104 (Fast Rectifier)	R505	9965 000 15057 4.7k 5% 0.16W
R843	9965 100 03189	1Ω 5% 1W	D402	9965 100 03091	FR104 (Fast Rectifier)	R506	9965 000 17938 750Ω 5% 0.16W
R844	9965 100 02999	1kΩ 5% 1/6W	D403	9965 100 02996	1N4148 (Switching)	R507	9965 000 14049 100Ω 5% 0.16W
R845	9965 000 15771	1KΩ 1/4W 5% Carb. Film	D404	9965 000 15818	BZX79-C6V2	R508	9965 000 15057 4.7k 5% 0.16W
R851	9965 000 14050	10k 5% 0.16W	D405	9965 100 03091	FR104 (Fast Rectifier)	R509	9965 000 17938 750Ω 5% 0.16W
R901	9965 000 27858	27kΩ 5% 1/6W	D406	9965 100 02996	1N4148 (Switching)	R510	9965 000 15409 15k 5% 2W
R903	9965 100 02999	1kΩ 5% 1/6W	D440	9965 100 02996	1N4148 (Switching)	R511	9965 000 15409 15k 5% 2W
R904	9965 100 03143	75Ω 5% 1/6W	D442	9965 100 03095	Diode BZX79BXXX	R512	9965 000 15409 15k 5% 2W
R905	9965 100 02999	1kΩ 5% 1/6W	D625	9965 100 02996	1N4148 (Switching)	R514	9965 100 03001 2.7kΩ 5% 1/2W
R906	9965 100 03144	82Ω 5% 1/6W	D626	9965 100 02996	1N4148 (Switching)	R515	9965 100 03001 2.7kΩ 5% 1/2W
R907	9965 100 02999	1kΩ 5% 1/6W	D801	9965 000 15164	RL255	R518	9965 100 03001 2.7kΩ 5% 1/2W
R908	9965 100 02999	1kΩ 5% 1/6W	D802	9965 000 15164	RL255	R521	9965 000 17939 100k 5% 0.25W
R912	9965 100 02999	1kΩ 5% 1/6W	D803	9965 000 15164	RL255	R522	9965 100 02999 1kΩ 5% 1/6W
R914	9965 100 03144	82Ω 5% 1/6W	D804	9965 000 15164	RL255	R523	9965 100 03000 680Ω 5% 1/6W
R918	9965 000 14050	10k 5% 0.16W	D809	9965 000 20421	1H8	R524	9965 100 03086 RES. C.F. 5.1K OHM 1/6
R919	9965 000 14050	10k 5% 0.16W	D814	9965 100 02996	1N4148 (Switching)	R525	9965 100 03000 680Ω 5% 1/6W
R922	9965 000 14055	33kΩ 5% 1/6W	D819	9965 100 02996	1N4148 (Switching)	R526	9965 100 03000 680Ω 5% 1/6W
R922A	9965 000 27858	27kΩ 5% 1/6W	D820	9965 100 03091	FR104 (Fast Rectifier)	R527	9965 100 03000 680Ω 5% 1/6W
R923	9965 000 13960	470Ω 5% 0.16W	D821	9965 100 03172	Zener 18V 1/2W 5%		
R926	9965 000 14585	47kΩ 5% 1/6W	D830	9965 100 03174	Diode GRU3ZX		
R927	9965 000 14585	47kΩ 5% 1/6W	D833	9965 000 44366	Rectifier RU3A		
R928	9965 000 14585	47kΩ 5% 1/6W	D840	9965 100 02996	1N4148 (Switching)	D501	9965 100 02996 1N4148 (Switching)
R929	9965 000 14585	47kΩ 5% 1/6W	D841	9965 000 44714	Diode RU3YX	D502	9965 100 02996 1N4148 (Switching)
R930	9965 000 14585	47kΩ 5% 1/6W	D844	9965 100 03173	Zener 7V5 1/2W 5%		
R931	9965 000 14585	47kΩ 5% 1/6W	D902	9965 000 15818	BZX79-C6V2		
R932	9965 100 02999	1kΩ 5% 1/6W	D903	9965 000 15818	BZX79-C6V2		
R933	9965 100 02999	1kΩ 5% 1/6W					
R935	9965 000 14585	47kΩ 5% 1/6W					
R936	9965 000 14585	47kΩ 5% 1/6W					



Q501	9965 100 02998	TRANSISTOR 2SC2482
Q502	9965 100 02998	TRANSISTOR 2SC2482
Q503	9965 100 02998	TRANSISTOR 2SC2482
Q510	9965 100 02997	ST2SA1015Y (PNP)

# 11. Revision List

- Manual xxxx xxx xxxx.0
- First release.